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NEWS AND VIEWS

Several readers have commented on the absence of this feature, and one has gone so far as to 'regret its termination'. This feature now turns up again with apologies!

It gives us pleasure to comment on current entomological topics from time to time, but both time and space are pressing and it is not always possible to spare one or the other.

In order to catch up a little on the delays in publication experienced during this year we have decided to issue the index for the current volume (Vol. 9) with the next number.

It is not our practice to publish Obituaries, but the recent passing of two really great figures in the entomological world cannot pass unnoticed. **Mr. R. W. Lloyd,** the publisher of **The Entomologist's Monthly Magazine,** was famed in many fields other than entomology, and we have noticed obituaries in many journals concerned with widely differing subjects. **Dr. F. I. van Emden** was an entomologist in the widest sense. As well as having an encyclopædic grasp of entomology in general he was a world-famed specialist in groups as wide apart as the Coleopterous family *Carabidae,* the Dipterous family *Tachinidae,* and on the larvae of the Coleoptera in general.

The entomological world will be the poorer for the passing of both these men.

We sincerely regret the necessity of substantially raising our subscription for next year (Vol. 10). We last made an increase in our subscription two years ago and almost immediately this was swallowed up in increased costs. In each year for the last five years we have made a loss, which has been met from private pockets (this in spite of the fact that all expenses other than printing have for several years past also been paid privately; we must make an effort to put the **Gazette** on a proper business footing. We have no intention of making a profit, but we do not want to continue to make a loss.

Our difficulties regarding subscriptions have been twofold. First is the important factor that the subscription at its present level is not paying the printing, postage and stationery bills. Secondly, in spite of all appeals the subscriptions have straggled in over a period of nearly twelve months. In fixing the new subscription we have given much thought to this latter problem and have decided to offer a considerable inducement to subscribers who are willing to help by prompt payment. The new subscription will be **£2 2s.**—but for payment before 1st February this will be reduced to **£1 16s.** We hope, and are confident, that the standard of the material we are publishing, and have for publication, will ensure that the number of subscribers will not fall owing to the necessity of raising the subscription.

During the coming year we shall publish the second part of the very important paper, **An Illustrated List of the British Tortricidae,** by **Mr. J. D. Bradley** (the first part was published in **Ent. Gaz.:** Vol. 7, No. 3, July, 1956). This paper will be illustrated by about 20 plates, and we are hoping to be able to publish it in one part.

We also hope to commence the publication of an authoritative new **List of the British Lepidoptera**, by **I. R. P. Heslop**. This list will give the up-to-date names of all species and will be a great boon to the poor, bewildered amateur lepidopterist who meets new names every time he opens a book or magazine and does not know where to turn for guidance. As far as possible the names used for the Macrolepidoptera will be in accord with those which will be used in the new edition of **British Moths**, by **Richard South**, which is in preparation and will therefore be a serious attempt to stabilize references for some years to come. We hope also to reprint this list as a **Label List**, and are indebted to Messrs. W. H. T. Tams, H. M. Edelsten, D. S. Fletcher and J. D. Bradley for their assistance.

A FIELD KEY FOR THE IDENTIFICATION OF *TIPULA* LARVAE (DIPT: TIPULIDAE)

By ALLAN BRINDLE, F.R.E.S.

Introduction

The larvae of this genus of Diptera have been studied for many years in connection with agricultural entomology since the larvae of the common *Tipula paludosa* Mg., constitute one of the serious pests of arable land. Research, however, has been chiefly centred on this one species, and the biology of the remaining species has been comparatively neglected. Beling (1873, 1878, and 1886) described a number of Tipula larvae, but his descriptions are unaccompanied by drawings and are insufficient to separate one species from another. Several of the descriptions have been found to be based on errors of identification, presumably of the adults which emerged from the larvae. In spite of this unfortunate feature, however, he must rank as one of the pioneers of this kind of research, and certainly some of his descriptions are accurate, though not complete. Other authors, such as Czizek (1913) used Beling's descriptions with due acknowledgement.

Apart from papers dealing with separate species, such as Oldham (1928), White (1951) and others, the most complete papers in recent years dealing with the identification of Tipula larvae appear to be those of Savtshenko (1955) and Chiswell (1956). The former dealt with a number of larvae of the Russian Tipulinae, including eighteen species of Tipula on the British list, and had drawings of the spiracular disc of the anal segment which give characters for separating the species of the larvae. Chiswell (1956) similarly illustrated the anal segments of a number of larvae of the British Tipulinae with a key for their separation, and amongst the larvae described and figured were twenty-seven species of Tipula.

In the past few years more larvae of this genus have been identified and it is now possible to recognize 43 species of the larvae, in most cases by the use of a hand lens only. This total includes all the well distributed species, except for *T. melanoceros* Schum., and *T. peliostigma* Schum. The larvae of the former is apparently unknown; that of the latter has been described by Beling (1878), but the description is not sufficient to separate it from other closely related larvae. The remaining thirteen species of British Tipula are all listed as rare.

There are certain larvae which do not seem to be separable from closely allied larvae on field characters. These are the larvae of *T. lateralis* Mg., and *T. montium* Egg.; *T. paludosa* Mg., and *T. czizeki* de Jong; and *T. marmorata* Mg., and *T. alpium* Bergr. The characters separating the larvae of *T. staegeri* Niels., and

T. signata Staeg., from the latter two species are also unsatisfactory, and it may prove that all these four species of larvae are inseparable on field characters (see page 174).

Nevertheless the provision of a field key for the identification of the larvae known and separable should be useful for the worker in research on soil populations and similar work, and it may afford characters by which other species of larvae yet to be described could be separated.

General features of Tipula larvae

The larvae of the genus constitute a remarkably homogenous group. They are generally cylindrical, possess a massive retractile head capsule, and an extremely tough cuticle, hence the common name of leather jackets (Fig. 1). Since the cuticle is usually unpigmented, variation in the colour of larvae of the same species occurs, though this is not invariable. The colour ranges from white to dark brown or grey, depending to some extent on their food. Larvae from dark soils are generally darker in colour than the same species of larvae from light soils. The larvae of *T. irrorata* Macq., may be pinkish, grey or brown. The larvae of *T. flavolineata* Mg., are always white, and the larvae of *T. pagana* Mg., *T. hortulana* Mg., and *T. variipennis* Mg., are brownish. Some species of larvae (*T. pruinosa* Wied., *lateralis* Mg., *montium* Egg., *couckei* Tonn., *solstitialis* Westh., *cheethami* Edw., *rufina* Mg.) possess a prominent though ill-defined pattern of longitudinal lines along the dorsum, whilst the larvae of *T. brevispina* Pierre, *fascipennis* Mg., *scripta Mg.*, and others have a silky appearance due to a covering of very short pale pubescence.

The larvae in general can only be confused with the larvae of *Nephrotoma*; the latter however possess two raised welts on the dorsum of the prothorax which are lacking in Tipula larvae. The white larvae of *T. flavolineata* Mg., are similar to the larvae of *Tanyptera*, but Chiswell (1956) indicates the separation characters. The anal segment of the larva of *T. luteipennis* Mg., resembles that of the larvae of *Prionocera*, but in the latter the lobes are much narrower and the larvae are brownish.

Normally the larvae have no spines, but that of *T. pabulina* Mg., appears to be spiny. The features of this unusual larva are taken from one specimen only, kindly loaned by Mr. D. Bryce, B.Sc. A detailed description of the larva must be delayed until more specimens are obtained, but confirmation of the species is given by the spiracular disc which resembles that of *T. truncorum* Mg. closely, a feature which would be expected considering their close relationship.

They are usually considered to be herbivorous, though instances of predatory tendencies have been recorded. Whilst examining several larvae of *T. hortulana* Mg., in water in a small dish, one larvae was seen to seize another by the side, at the junction of the third and fourth abdominal segment. For several seconds this grip was held

whilst the victim performed convulsive movements, after which the aggressor released its hold and wandered off. No injury was apparent, presumably due to the inability of the mandibles to penetrate the cuticle. It seems possible though that after a moult the cuticle could be torn, and this may explain the occasional disappearances of larvae which seem to occur during breeding, especially if the larvae are rather crowded. A larva of *T. lateralis* Mg., has been seen to feed on the white fat body of a damaged *Limnophila* larva, and Chiswell (1956) records the same species eating a Chironomid larva whole.

The anal segment

A characteristic feature of the larvae, which is shared by some related genera is the structure of the anal segment, on the characters of which the key is largely based. Seen from the rear (Fig. 2) this bears a spiracular disc with two spiracles surrounded by six lobes. Ventral to this is the anus, and around the anus are fleshy protuberances termed anal papillae.

The lobes are distinguished in pairs as the dorsal, lateral, and ventral lobes. These lobes can be contracted so as to cover the spiracular disc, evidently to exclude dirt from the spiracles. They are not contracted when the larvae are immersed in water, but are violently contracted if the larvae experience unpleasant vapour, e.g. when strong orthodichlorbenzene is used to bring them to the surface. In two aquatic or sub-aquatic species (*T. cheethami* Edw., and *T. luteipennis* Mg.) the lobes are fringed with long hairs to provide buoyancy when the spiracular disc is thrust above the water surface.

A common character is the development of blackish areas of sclerotization on the disc or on the lobes. Evidently this serves to stiffen the lobes and reaches a high degree in the larvae of the *Lunatipula* subgenus, where most of the dorsal lobe surface is sclerotized and is produced into a forwardly projecting hook (Fig. 3). In the larvae of *T. livida* V.d.W., the entire dorsal and lateral lobes have been sclerotized and appear as long curved spines.

The anal papillae appear to function as osmo-regulatory organs and their number and shape are correlated with the water content of the environment of the larvae, the larvae living in wetter conditions having more numerous and longer anal papillae. The larvae of the genus as a whole fall into six distinct groups according to the shape and number of the anal papillae. The papillae of each group are shown, diagrammatically from the ventral aspect, in Figs. 4 to 9. The basic number appears to be four and in most species of larvae these are rounded (Fig. 4). This represents the simplest form and the larvae inhabit damp soil or detritus. From this simplest form an apparent development occurs firstly with the elongation of the lateral papillae (Fig. 5), followed by elongation of the ventral pair (Fig. 6). This is correlated with a wetter habitat, the larvae of

the last group being found in marshy soils. An additional pair of papillae next appears (Fig. 7), followed by a second additional pair (Fig. 8). In the last group eight unequal papillae are present, with the habitat now being very wet soils, or even being freely aquatic, being found amongst pebbles on beds of small rivulets or in aquatic moss. The last development seems to be the reduction in size of the longest papillae, producing four small pairs (Fig. 9). These vary in shape, often being conical, not parallel-sided as shown in the diagram. This reduction in size appears to be correlated with the dryer habitat, this being moss on walls, trees, stones, etc., with three exceptions. These are the larvae of *T. subnodicornis* Zett., and *T. macrocera* Zett., both being found in semi-aquatic moss such as sphagnum, and the larvae of *T. cheethami* Edw., which occur in aquatic moss.

Although in general these basic habitats are the ones in which most specimens of any particular larva are found, larvae also occur in totally different habitats, e.g. those of *T. oleracea* L. and *T. lateralis* Mg., in aquatic moss.

The six types of anal papillae are reasonably constant and readily separable on inspection. They are not invariably fully extended on preservation, however, and it is better to examine these in water whilst the larvae are alive. The larvae of *T. pagana* Mg., have been placed in group I, since they appear to have four rounded papillae, but there seems to be a tendency to develop small protrusions which gives the impression that there are eight small papillae (group 6). This interesting feature may indicate possible affinities with the latter group. The larvae of this species, however, are readily recognized by being small and entirely brownish. Some larvae of group 6 develop a brownish tint in the first few segments, but never seem to be entirely brown. Comparison of the anal segment if in doubt will settle the species.

It is noteworthy that in dry pasture soils the chief and often the only larvae found are those of *T. paludosa* Mg., a feature which suggests that this is not a particularly favoured habitat for Tipula larvae, and that the abundance of this species indicates a successful invasion of a habitat in which few of its relatives can compete.

I have already pointed out (1957) a curious feature of the anal papillae of the larvae of *T. oleracea* L. The larvae of this species and those of *T. paludosa* Mg., and *czizeki* de Jong are usually held to be indistinguishable. All the larvae of *T. oleracea* L. I have bred out, from aquatic moss or damp soils, have had four anal papillae, and thus this species is included in group 3, whilst the other two species of larvae, with only two long papillae, are included in group 2. I have not bred *T. czizeki* de Jong, and so this species is included together with *T. paludosa Mg.*, in the key. More observations on this feature are being undertaken in order to clarify the position.

Notes on the key

The key is largely based on characters of the anal segment. Each group is firstly separated on the features of the anal papillae. Further distinctions within each group chiefly consist of the shape and extent of the markings on the spiracular disc, or the extent of sclerotization of the lobes. The characters used in most cases have been tested and seem to be constant from the second instar onwards. Other characters are not as certain, and it would be very useful if users of the key would indicate the characters which, by a wide use, have been found to vary or to prove unsatisfactory in any way. Some characters are to be found in Chiswell (1956); the rest have not been previously published. The characters are, however, readily seen when comparing the anal segments.

Each drawing, with the exceptions of the ones taken from other sources, has been made from camera lucida drawings, but have been rendered rather diagrammatically in order to emphasize the characters used in the key. Each represents the anal segment of the larva as seen from the rear. The ventral lobes are usually held out backwards, so their shape is distorted in this view. When coloration of the lobes is necessary for identification a separate drawing of these from the dorsal view is given. Two species of larvae (*T. cheethami* Edw. and *T. luteipennis* Mg.) normally hold out their lobes widely, consequent on their aquatic habitat, so all the surfaces of the lobes are shown.

When a spiracular disc and papillae are identical in two species both names are included, e.g. *lateralis* Mg., or *montium* Egg. (Fig. 41). If the spiracular disc is similar but other characters separate the larvae, their names are included in parentheses, e.g. *couckei* Tonn. and *solstitialis* Westh. (Fig. 41). In the key the separation characters will be found.

If the larvae are immersed in water the anal segment is completely expanded, and details can be readily seen by the use of a hand lens, especially if the larvae can reach the surface of the water with the anal segment. This presents the spiracular disc as shown in the drawings. No details of chaetotaxy are included in the drawings or key.

The larvae are best killed by immersion in hot water (50-60 degrees C.) and stored later in Pampel's fluid. This method usually, but not always, ensures that the anal segment is fully expanded.

ACKNOWLEDGEMENTS

The drawings and characters of the larvae of *T. variicornis* Schum., *T. selene* Mg. and *T. livida* V.d.W. are based on Chiswell (1956), by kind permission of the Royal Entomological Society of London; those of *T. truncorum* Mg., *T. nigra* L. and *T. obsoleta* Mg. are based on Savtshenko (1955); and the drawing of the larva of *T. cheethami* Edw. is based on Bryce (1956), with permission of the Editors of the *Ent. mon. Mag.*

REFERENCES

BELING, T., 1873. Beitrag zur Naturgeschichte verschiedener Arten aus der Familie der Tipuliden, *Verh. zool-bot. Ges.* Wien. **23**:575-592.
1878. Zweiter Beitrag zur Naturgeschichte (Metamorphose) verschiedener Arten aus der Familie der Tipuliden. Ibid. **28**:21-56.
1886. Dritter Beitrag zur Naturgeschichte (Metamorphose) verschiedener Arten aus der Familie der Tipuliden. Ibid. **36**:171-214.
CZIZEK, K., 1913. Tipulidae Moravicae. Part 2. *Mährischen Landesmus., Zschr.* **13**:53-178.
OLDHAM, J. N., 1928. On the final larval instar of *Tipula paludosa* Meig., and *Tipula lateralis* Meig. *Proc. R. phys. Soc. Edinb.* **21**:217-252, 32 figs.
WHITE, J. H., 1951. Observations of the life history and biology of *Tipula lateralis* Meig. *Ann. appl. Biol.* **38**:847-858, 7 figs.
SAVTSHENKO, E. H., 1955. Characters differentiating larvae of the most common species of Diptera Tipulidae. *Zool. ZH.* **34**:822-836.
CHISWELL, J. R., 1956. A taxonomic account of the last instar larvae of some British Tipulinae (Diptera-Tipulidae). *Trans. R. ent. Soc. Lond.* **108**:409-484, 110 figs.
BRYCE, D., 1956. Notes on the life history of *Tipula cheethami* Edw. (Diptera-Tipulidae). 3 figs.*Ent. mon. Mag.* **92**:140.
BRINDLE, A., 1958. Notes on the identification of Tipula larvae (Diptera Tipulidae). Part I, 12 figs. *Ent. Gaz.* **9**:45-52.

Field Key to the larvae of the genus Tipula

Larvae with—

(a) four rounded papillae (Fig. 4) ..... Group 1
(b) two rounded and two long papillae (Fig. 5) ..... Group 2
(c) four long papillae (Fig. 6) ..... Group 3
(d) six long papillae (Fig. 7) ..... Group 4
(e) eight unequal papillae (Fig. 8) ..... Group 5
(f) eight equal papillae (Fig. 9) ..... Group 6

Group 1. General habitat damp soil.

1 (2) Dorsal and lateral lobes forming long curved spines (Fig. 10) ..... *livida* V.d.W.
(In leaf mould or moist soil in woods.)
2 (1) Dorsal and lateral lobes normal
3 (14) Dorsal lobes heavily sclerotized and produced apically into forwardly projecting hooks (Fig. 3).
4 (7) Stripes on lateral lobes narrow, width about half that of spiracular border.
5 (6) Dorsal lobes shorter than lateral lobes; black patches on dorsal lobes short and broad (Fig 11) ..... *scripta* Mg.
(In damp soil under moss, detritus, woodland soil.)
6 (5) Dorsal lobes longer; black patches on dorsal lobes long, parallel sided (Fig. 13) ..... *fascipennis* Mg.
(In damp soil under moss, damp woodland or pasture soil.)
7 (4) Stripes on lateral lobes wider, equal in width to spiracular border.

8 (9) Pigmented patches on ventral lobes extensive, separated by a distance less than the width of the spiracles (Fig. 14, 17) ..... *lunata* L.
(In leaf mould, damp woodland soil, soil under moss.)
9 (8) Pigmented patches on ventral lobes separated by a distance greater than width of spiracles.
10 (11) Ventral lobe about as long as broad, entire surface pigmented (Figs. 15, 18) ..... *selene* Mg.
(In detritus in old wood.)
11 (10) Ventral lobe half as long as breadth at base, surface not entirely pigmented.
12 (13) Dorsal lobe longer, distance between bases of patches on dorsal lobes small (Fig. 16). Ventral lobe pigmented (as Fig. 20) ..... *brevispina* Pierre
(In damp soil under moss, woodland soil.)
13 (12) Dorsal lobe shorter, distance between bases of patches on dorsal lobe greater, equal to diameter of spiracles (Fig 19). Ventral lobe pigmented (as Fig. 21) ..... *cava* Ried.
(In damp woodland soil, detritus.)
14 (3) Dorsal lobes not hooked apically.
15 (16) Larva white, in decaying wood (Fig. 22) ... *flavolineata* Mg.
16 (15) Larva not white.
17 (20) Dorsal lobes with pigment extending to tip.
18 (19) Dorsal lobes shorter than lateral lobes (Fig. 12) ..... *excisa* Schum.
(In pockets of soil in mountain screes.)
19 (18) Dorsal lobes as long as lateral lobes (Fig. 23) *vernalis* Mg.
(In pasture soil.)
20 (17) Dorsal lobes with apex unpigmented.
21 (24) Dorsal lobes with at least basal half pigmented (Fig. 25).
22 (23) Tip of ventral lobes unpigmented (Fig. 27). Larva dark brownish grey ..... *nubeculosa* Mg.
(In damp soil under moss, or woodland soil.)
23 (22) Tip of ventral lobes darkened (Fig. 26). Larva grey ..... *rubripes* Schum.
(In damp woodland soil.)
24 (21) Dorsal lobes unpigmented except for extreme base.
25 (30) Dorsal lobes with basal black patch extending across the width of base of lobes (Figs. 28, 31).
26 (29) Stripe on lateral lobe narrow (Fig. 31). Larvae brownish.
27 (28) Ventral lobe with entire surface pigmented uniformly (Fig. 29) ..... *hortulana* Mg.
(In damp soil under moss, damp woodland soil.)
28 (27) Ventral lobes with apical part darkened, basal half much lighter (Fig. 30) ..... *variipennis* Mg.
(In woodland soil.)
29 (26) Stripe on lateral lobes wider (Fig. 28). Larvae usually

greyish ..... *irrorata* Macq.
(In soft decayed wood or detritus, soil, etc.)
30 (25) Dorsal lobes without basal patch or with a very small one.
31 (34) A small black patch at base of dorsal lobes (Fig. 32).
32 (33) Lateral and dorsal lobes subequal (Fig. 32). Ventral lobes with a median dark line (Fig. 33) ..... *nigra* L.
(In marshy soils.)
33 (32) Lateral lobes longer than dorsal lobes (Fig. 36). Ventral lobes unpigmented except for a basal black patch. (Not shown in Fig. 35) ..... *pabulina* Mg.
(In damp soil or moss in woods.)
34 (31) No small black patch at base of dorsal lobes.
35 (36) Lateral lobes longer than dorsal lobes (Fig. 36). Ventral lobes pigmented at sides and border (Fig. 34—basal black patch omitted) ..... *truncorum* Mg.
36 (35) Dorsal and lateral lobes subequal (Fig. 24) ... *pagana* Mg.
(In moss on soil or in soil beneath moss in woods.)

Group 2. General habitat marshy or pasture soils

1 (2) Small blackish patches at base of dorsal lobes and to the outside of the spiracles (Fig. 37) ..... *unca* Wied.
(In marshy or damp soils.)
2 (1) Base of dorsal lobes unmarked (Fig. 38) .....
..... *paludosa* Mg., *czizeki* de Jong
(In pasture soils generally.)

Group 3. General habitat marshy soils

1 (2) Dorsal lobes heavily sclerotized and semi-circular in shape (Fig. 46) ..... *variicornis* Schum.
(In damp woodland soil near streams.)
2 (1) Dorsal lobes normal.
3 (4) Dorsum with longitudinal stripes forming a prominent though ill-defined pattern. Anal segment similar to *lateralis* (Fig. 41), but only four papillae are present .....
..... *solstitialis* Westh.
(In marshy soils.)
4 (3) Dorsum not patterned.
5 (6) Papillae thick and short (Fig. 43) ..... *oleracea* L.
(In aquatic moss, damp soils.)
6 (5) Papillae at least longer than broad.
7 (8) Dorsal lobes with sharply defined red brown borders (Fig. 42). Ventral lobes heavily darkened across base (Fig. 44) ..... *vittata* Mg.
(In marshy soils.)
8 (7) Dorsal lobes with ill-defined borders (Fig. 2). Ventral lobes less heavily darkened (Fig. 45) ..... *luna* Westh.
(In marshy soils.)

Group 4. General habitat marshy or damp soils.

1 (2) Lobes margined with long hairs, the hairs being longer than width of lobes (Fig. 39) ..... *luteipennis* Mg. (In marshy soils with standing water.)
2 (1) Lobes with short marginal hairs.
3 (4) Dorsum of last abdominal segment with two small protuberances, each covered with dense blackish hairs (Fig. 40) ..... *pruinosa* Wied. (In marshy soils.)
4 (3) Dorsum normal.
5 (6) At least one pair of anal papillae longer than width of anal segment. Disc otherwise similar to that of *lateralis* (Fig. 41) ..... *couckei* Tonn. (In damp soils by rivers.)
6 (5) Anal papillae shorter, none longer than width of anal segment (Fig. 41) ..... *lateralis* Mg., *montium* Egg. (In damp soils by rivers, aquatic moss.)

Group 5. General habitat marshy soils, aquatic moss, etc.

1 (2) Dorsal and lateral lobes with sharply defined but not continuous borders (Fig. 48). Ventral lobes darker at base (Fig. 50) ..... *maxima* Poda (In marshy soils, amongst pebbles in rivulets.)
2 (1) Dorsal and lateral lobes with vaguely defined though continuous borders (Fig. 47). Ventral lobes less dark (Fig. 49) ..... *fulvipennis* Deg. (In marshy soils, in aquatic moss.)

Group 6. General habitat moss

1 (2) Lobes margined with long hairs, the hairs longer than width of lobes (Fig. 53) ..... *cheethami* Edw. (In aquatic moss in waterfalls, etc.)
2 (1) Marginal hairs short.
3 (6) Surface of lobes entirely sclerotized, and of a reddish brown colour.
4 (5) Surface of lobes with dark margins (Fig. 51) .... *subnodicornis* Zett. (In sphagnum, polytrichum on moors.)
5 (4) Surface of lobes with a medium dark line (Fig. 52) .... *macrocera* Zett. (In hypnum in moorland marshes.)
6 (3) Surface of lobes not entirely sclerotized.
7 (8) Larvae with dorsum heavily patterned. Dark margins of lobes extending down to spiracles (Fig. 54) ..... *rufina* Mg. (In moss on walls, in streams, etc.)
8 (7) Dorsum not patterned.

9 (10) Markings to inside of spiracles small, square-shaped (Fig. 57) ..... *obsoleta* Mg

10 (9) Markings to inside of spiracles larger.

The remainder are very unsatisfactory. Previously (1957) I mentioned the doubt concerning these markings. It would seem to be better to regard the distinctions as possibly applying only to extreme cases. There appears to be a complete gradation from *staegeri* (Fig. 55) to *marmorata* (Fig. 58), and it is probable, as mentioned earlier in this paper that these four species of larvae are inseparable on field characters.

11 (14) Markings to outside of spiracles hook-shaped. Ventral lobe darker (Fig. 59).

12 (13) Markings to inside of spiracles irregular (Fig. 55) ....*staegeri* Niels.

13 (12) Markings to inside of spiracles regular, fan-shaped (Fig. 56) ..... *signata* Staeg.

14 (11) Markings to outside of spiracles straight (Fig. 21). Ventral lobe lighter (Fig. 60) ..... *marmorata* Mg., *alpium* Bergr. (All in moss on walls, stones, trees.)

List of British Tipula species, arranged in groups

Group 1	*livida* V.d.Wulp	Fig. 10
„	*scripta* Mg.	Fig. 11
„	*excisa* Schum.	Fig. 12
„	*fascipennis* Mg.	Fig. 13
„	*lunata* L.	Figs. 14, 17
„	*selene* Mg.	Figs. 15, 18
„	*brevispina* Pierre	Figs. 16, 20
„	*cava* Riedel	Figs. 19, 21
„	*flavolineata* Mg.	Fig. 22
„	*vernalis* Mg.	Fig. 23
„	*pagana* Mg.	Fig. 24
„	*rubripes* Schum.	Figs. 25, 26
„	*nubeculosa* Mg.	Figs. 25, 27
„	*irrorata* Macq.	Fig. 28
„	*hortulana* Mg.	Figs. 31, 29
„	*variipennis* Mg.	Figs. 30, 31
„	*nigra* L.	Figs. 32, 33
„	*pabulina* Mg.	Figs. 35, 36
„	*truncorum* Mg.	Figs. 34, 36
Group 2	*unca* Wied.	Fig. 37
„	*paludosa* Mg.	Fig. 38
„	*czizeki* de Jong	Fig. 38
Group 3	*vittata* Mg.	Figs. 42, 44
„	*luna* Westh.	Figs. 3, 45

„	*oleracea* L.	Fig. 43
„	*variicornis* Schum.	Fig. 46
„	*solstitialis* Westh.	Fig. 41
Group 4	*lateralis* Mg.	Fig. 41
„	*montium* Egg.	Fig. 41
„	*couckei* Tonn.	Fig. 41
„	*pruinosa* Wied.	Fig. 40
„	*luteipennis* Mg.	Fig. 39
Group 5	*fulvipennis* Deg.	Figs. 47, 49
„	*maxima* Poda	Figs. 48, 50
Group 6	*subnodicornis* Zett.	Fig. 51
„	*macrocera* Zett.	Fig. 52
„	*cheethami* Edw.	Fig. 53
„	*rufina* Mg.	Fig. 54
„	*staegeri* Niels.	Fig. 55
„	*signata* Staeg.	Fig. 56, 59
„	*obsoleta* Mg.	Fig. 57
„	*marmorata* Mg.	Figs. 58, 60
„	*alpium* Bergr.	Figs. 58, 60

Not included in the key

yerburyi Edw.
mutila Wahl.
microstigma Pierre
pseudovariipennis Czizek
winthemi Lacks.
bistilata Lunds.
serrulata Lacks.
vafra Ried.
marginata Mg.
coerulescens Lacks.
melanoceros Schum.
juncea Mg.
peliostigma Schum.
helvola Loew.
siebkei Zett.

I. luna

Fig. 1. Larva of *Tipula luna* Westh.

2. luna

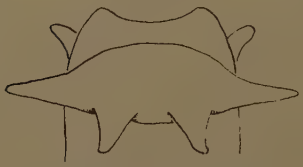
3. lunata

4. papillae, Group I

7. papillae, Group 4

5. papillae, Group 2

8. papillae, Group 5



6. papillae, Group 3

9. papillae, Group 6

Anal segments of Tipula larvae.

Group I

I0. livida

II. scripta

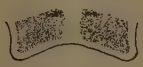
I2. excisa

I3. fascipennis

I4. lunata

I5. selene

I6. brevispina



I7. lunata

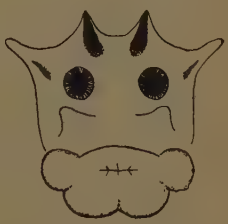
I8. selene

I9. cava

20. brevispina

2I. cava

22. flavolineata



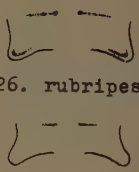
23. vernalis

Anal segments of Tipula larvae

Groups I and 2

24. pagana

25. rubripes or nubeculosa



26. rubripes

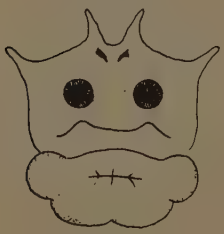
27. nubeculosa

28 irrorata

29 hortulana

30 variipennis

31 hortulana or variipennis

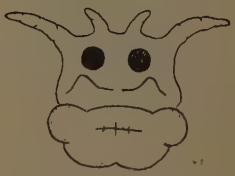


32 nigra

33 nigra

34 truncorum

35 pabulina

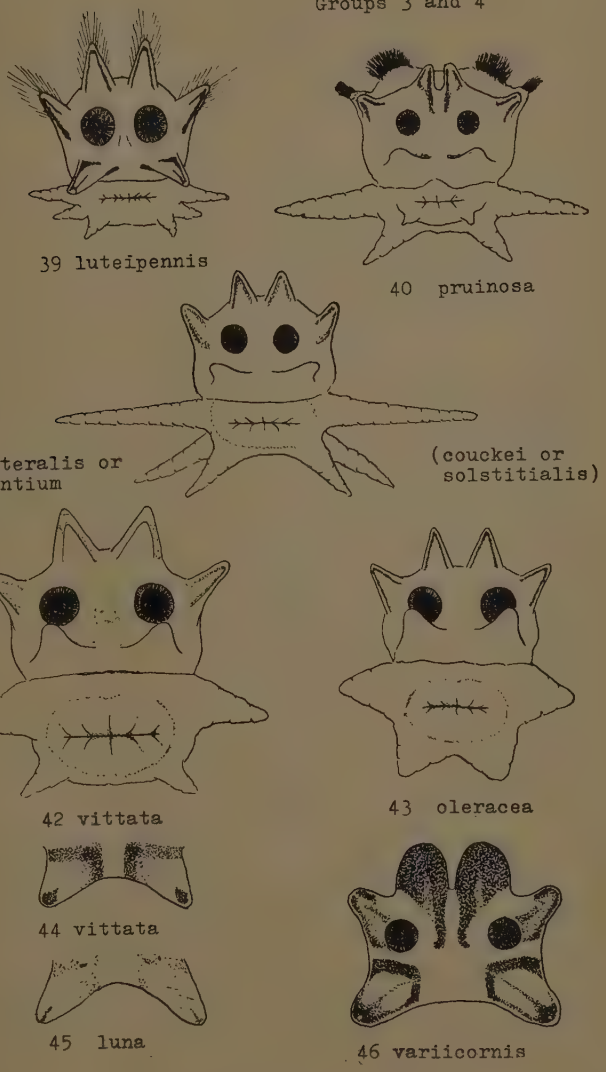


36 truncorum or pabulina

37 unca

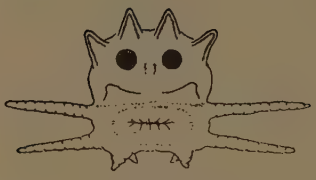
38 paludosa or czizeki

Anal segments of Tipula larvae

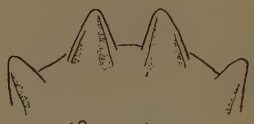


Anal segments of Tipula larvae

Groups 5 and 6



47 fulvipennis



48 maxima

49 fulvipennis 50 maxima

51 subnodicornis

52 macrocera

53 cheethami

54 rufina

55 staegeri

56 signata

57 obsoleta

58 marmorata or alpium

59 signata

60 marmorata

Anal segments of Tipula larvae

A FIELD KEY FOR THE IDENTIFICATION OF *TIPULA* LARVAE (DIPTERA-TIPULIDAE)

By ALLAN BRINDLE, F.R.E.S.

SUPPLEMENT

Since the above paper was accepted for publication in the *Entomologists' Gazette* more work has resulted in the separation of the larvae of *T. lateralis* Mg. and *montium Egg.*, which were not separated in the key, and the identification of the larva of *T. melanoceros* Schum., which was not included. With this supplement, and the key, 44 species of the larvae of this genus can be identified.

During the present year a second check on possible features to separate the larvae of *lateralis* and *montium* has been made, and the characters used appear to be constant. The two species of larvae may be separated as follows:

1 (2) Dorsal lobes of spiracular disc with narrow dark lines internal to the pigmented margin. Lateral lobes with narrow dark line near ventral margin (Fig. 61). Larva larger with dorsal pattern much less conspicuous; sometimes the dorsum is uniformly darker than the pleurae or ventral surfaces ..... *montium* Egg.

2 (1) Dorsal and lateral lobes of spiracular disc with the pigmented margin only (Fig. 41). Larva smaller with dorsal pattern prominent ..... *lateralis* Mg.

The anal segment of the larva of *T. melanoceros* Schum. closely resembles that of the larva of *T. luteipennis* Mg. The two species of larvae may be distinguished as follows:

1 (2) Lobes of spiracular disc with well marked dark patches forming a distinct pattern (Fig. 39). Larva whitish, rather long and thin, in marshy soil with standing water ... *luteipennis* Mg.

2 (1) Lobes of spiracular disc almost as white as disc itself, with only very faint indication of darkening. Larva grey, shorter and thicker, in wet acid peaty soil under sphagnum or in sphagnum ..... *melanoceros* Sch.

The larvae of *T. nubeculosa* Mg. and *rubripes* Schum. were only briefly keyed out. Further distinctions are:

1 (2) Sclerotised patches on dorsal lobes larger, triangular, rather curved; line at base of ventral lobes very dark. Larva brownish-grey, darker on last segment ..... *nubeculosa* Mg.

2 (1) Sclerotised patches on dorsal lobes narrower, triangular, straight; line at base of ventral lobes light. Larva grey .... *rubripes* Schum.

Fig. 61: *T. montium* Egg. Dorsal and lateral lobes of spiracular disc.

BOOK REVIEW

Wanderfalter, by Kurt Harz and Heinrich Wittstadt, Die Neue Brehm-Bucherei. Wittenberg, Germany. Part 191. 90 pp. 1 plate. Price 10s.

This small and popular booklet on the migration of butterflies and moths deals with the subject from the point of view of Central Europe. The coloured plate illustrates 47 species, nearly all considerably reduced in size, but generally recognizable. The species dealt with are divided into four groups: (1) Regular migrants, (2) Rare migrants, (3) Residents which are reinforced by regular immigrations from the South, and (4) Residents which may also be emigrants.

Nearly all the species dealt with are also considered as migrants in Britain, but include *Syntarucus telecanus, Leucania scutosa, Aporia crataegi, Hyloicus pinastri*, and *Stilpnotia salicis;* which either do not occur in Britain, or whose status as a migrant here is uncertain.

For each of the chief migrants there is a small section giving descriptions of the various stages, food plants, distribution and notes on migration. Since all but the last of these are found in many popular books, it is a pity that more space was not given to the migration sections with further details of evidence.

There is a useful general discussion, including the problem of orientation, and an account of methods of marking. Unfortunately, however, the emphasis is on the use of coloured dyes, and the use of small labels is only briefly mentioned, which give the finder some instructions as to what to do with his information.

A very useful brief survey for those familiar with the German language.

There is a bibliography of just under 100 references, which is useful, but in many cases incomplete, without date, volume or page.

C.B.W.

NOTES ON SPECIES OF THE GENUS *ZYGAENA* FABRICIUS

By W. G. TREMEWAN
Department of Entomology, British Museum (Natural History)

While working on the British *Zygaena* species, I found it necessary to examine the type material of certain Continental species and races, and in doing so I decided to select Lectotypes, as the authors did not select actual types.

An examination of the genitalia of the type material of *Zygaena heringi* Zeller showed this race to be conspecific with *Z. purpuralis* Brünnich. On examining the type material of ssp. *diaphana* Stdgr., which was originally described as a subspecies of *purpuralis*, I found it to be conspecific with *sareptensis* Rebel and *pimpinellae* Guhn; the latter having been separated as a good species by Reiss in 1940. The name *diaphana* takes precedence, being the earliest of the three, and is the name that should be used for the species.

There has been considerable controversy over the correct author of *sareptensis*. Some Continental workers attribute the name to Krulikowsky, 1897 (*Soc. Entomologica*, **12**: 1), but this author uses the name in a *nomen nudem* sense, since he gives no description to *sareptensis*, and states that he did not know whether the form he had before him was *sareptensis*. The first valid use of the name was in 1901 in Staudinger and Rebel's Catalogue. Apparently it was listed in the exchange lists that Staudinger circulated, as Rebel stated 'Stdgr. i. l.'

Zygaena diaphana Staudinger.

Zygaena pilosellae var. *diaphana* Staudinger 1887, *Berl. ent. Z.*, **31**: 31.

Of the type material, there are seven specimens, four males and three females in the Staudinger collection. I have examined two males and one female; the rest of the material has been examined by Dr. B. Alberti, of the Zoologisches Museum, Berlin, who has confirmed that they are of the same specific status as the specimens I have seen. I designate a female as Lectotype.

Lectotype ♀ labelled 'Harjin, 18/5', ex. Staudinger coll. In Zoologisches Museum, Berlin.

Other material, 4 ♂♂ and 2 ♀♀ with the same data.

Zygaena diaphana ssp. **sareptensis** Rebel.

Zygaena purpuralis var. *sareptensis* Rebel 1901, in Staudinger and Rebel's Catalogue.

Zygaena sareptensis Krulikowsky, Reiss 1941, *Mitt. münchen. ent. Ges.*, **31**: 3, 987.

Of the original material, there are six specimens; the genitalia show that two of the males and three of the females are conspecific with *diaphana* Stdgr., the remaining female is *purpuralis* Brünn.

Lectotype ♀, labelled 'Sarepta, 90, Eck.', ex. Staudinger coll. In Zoologisches Museum, Berlin.

Other material. 2 ♂♂ and 1 ♀ with the same data. 1 ♀ labelled 'Taganrog'.

Zygaena diaphana ssp. **pimpinellae** Guhn.

Zygaena purpuralis f. *pimpinellae* Guhn, *Ent. Jb.*, 1932, **89**.

Zygaena pimpinellae Guhn, Reiss 1940, *Stettin. ent. Ztg.*, **101**: 3 : 4.

This race was described as a form of *purpuralis* Brünn., by Guhn in 1932. I have examined material from Berlin, which was determined by Dr. Alberti, and find it to be conspecific with *diaphana*. Superficially, it differs from *diaphana* in having the ground colour of the forewings translucent blue-black, with the streaks and hindwings crimson. The scaling is very much thicker.

Zygaena diaphana ssp. **pimpinellae** ab. **interrupta** Staudinger.

Zygaena pilosellae ab. *interrupta* Staudinger 1871, in Staudinger and Wocke's Catalogue, 45, 590 d.

This aberration has been associated with *purpuralis* and was described under that species, but I find that of the two original specimens, both males, one is conspecific with *diaphana;* the other specimen is a different species, viz., a streaked aberration of *Z. loti* S. & D. = *achilleae* Esp. I have designated as Lectotype the specimen which is conspecific with *diaphana,* and tentatively refer it to ssp. *pimpinellae*.

Lectotype ♂, original specimen without data, ex. Staudinger coll. In Zoologisches Museum, Berlin.

Zygaena purpuralis ssp. **heringi** Zeller.

Zygaena minos var. *heringi* Zeller 1844, *Stettin. ent. Ztg.*, **5**: 42.

An examination of the type material showed this race to be conspecific with *purpuralis* Brünn. Zeller described it from specimens from Stettin, and gave the description of the larvae as orange-yellow. He stated that the food-plant was Thyme.

Lectotype ♂, labelled 'Stettin, Hering, 10.41'. 'Zyg. Heringi Z., n. sp?, ent. Ztg.', ex. Zeller coll., Zygaenidae Slide No. 92.

Other material. 1 ♀, labelled 'Hering, Jan. 11.41'. 'Zyg. Heringi Z., ent. Ztg. n. sp?', ex. Zeller coll. Both specimens are in the British Museum.

Zygaena purpuralis ssp. **pseudodiaphana** ssp. nov.

Zygaena pilosellae var. *diaphana* Staudinger auct. nec. Staudinger.

Zygaena purpuralis var. *diaphana* Staudinger auct. nec. Staudinger.

I examined a series from Asia Minor under the name of *Z. purpuralis* ssp. *diaphana* Stdgr., and found that it was composed of two distinct species, viz., *Z. diaphana* Stdgr., and a subspecies of *pur-*

puralis Brünn. As already stated above, an examination of the syntypes of *diaphana* showed that insect to be distinct from *purpuralis*. The hitherto unrecognized subspecies of *purpuralis* I am naming **pseudodiaphana** ssp. nov., as it differs superficially from the type race found in Denmark. It closely resembles *diaphana* Stdgr., but may be readily separated on examination of the genitalia.

♂. Head, thorax and abdomen covered with dull black hair. Forewings blue-black, with the streaks and the hindwings scarlet, cilia of hindwings blue-black.

♀. Head, thorax and abdomen as in male. Forewings blue-black, often with golden scales, with the streaks and the hindwings scarlet; the cilia of the hindwings blue-black.

In both sexes the wings are very thinly scaled. The antennae are moderately clubbed.

Holotype ♀, 'Karacabey, Brussa, As. min., 930 V/2, Ajtai', Zygaenidae Slide No. 153.

Allotype ♂, with the same data, Zygaenidae Slide No. 152.

Paratypes, 7 ♂♂ with the same data as the Holotype; 5 ♀♀ with the same data; 1 ♂ labelled 'Asia Mineure, Broussa, Merkl. 1882'. ex. coll. Ch. Oberthür.

The types and paratypes are in the British Museum.

There is other material in the British Museum, from which the above examples were selected. However, I have not included it as paratype material, as it would be necessary to examine the genitalia of each specimen. The genitalia of the paratypes have been examined.

Zygaena trifolii ssp. **palustris** Oberthür.

Zygaena trifolii-palustris Oberthür 1896, *Etudes Entomologie* **20**: 45, Pl. 8, Figs. 151-153.

A type was not selected by Oberthür, who referred the race from Rennes to specimens under the name of *palustris* that he had seen in Boisduval's collection.

Lectotype ♀, labelled 'Env. de Rennes, Printemps 1894. Coll. Ch. Oberthür'. ex. coll. Rothschild. In British Museum. Zygaenidae Slide No. 160.

There is other material in the British Museum from which the Lectotype was selected.

I would like to express my sincere thanks to Dr. B. Alberti, of the Zoologisches Museum, Berlin, for the loan of the type material of *diaphana, sareptensis* and *interrupta,* and for verifying the results of my work on this species; also for the loan of *pimpinellae* material. I also have to thank Mr. P. Viette, of the Paris Museum, for information regarding the type material of *palustris* Oberth.

BOOK REVIEW

Annual Review of Entomology. Volume 3, 1858. Edited by Edward A. Steinhaus and Ray F. Smith (et alia). pp. 520. Illust. Cloth. 8vo. Annual Reviews Inc., Palo Alto, California. Price $7.00 post paid (U.S.A.), $7.50 post paid (elsewhere).

This book, the third volume of the series, maintains the wide and varied outlook shown in the first two volumes. As the editors state in the preface, the author selected to write an article is hoped to be '. . . . the person most capable of providing us with a review of high quality at the particular time concerned. This person may or may not be one considered by many to be *the* leader in his field, but almost always it is *one* of the recognized leaders in the field'. This is amply borne out on seeing the names of the authors of each of the twenty-three papers in this volume.

Of international scope, the papers are mainly concerned with the biology, morphology, and control of insects of many orders, although several papers do discuss systematics incidentally.

They cover The Nervous System (K. D. Roeder), Chemoreception in Arthropods (E. S. Hodgson), Internal Symbiosis in Insects (A. G. Richards and M. A. Brooks), Nutritional Requirements of Phytophagous Insects (W. G. Friend), Recent Advances in Silkworm Nutrition (J. M. Legay), Uses of Sound by Insects (H. Frings and M. Frings), Dynamics of Insect Population (A. J. Nicholson), Ovarian Structure and Vitellogenesis in Insects (P. F. Bonhay), Genetics and Breeding of the Honey Bee (W. C. Rothenbuhler), The Phylogeny of the Panorpoid Orders (H. E. Hinton), Zoogeography of Insects (J. L. Gressitt), Hybridisation and Speciation in Mosquitoes (L. E. Roseboom), The Feeding Habits of Biting Flies and Their Significance in Classification (J. A. Downes), Resistance of Plants to Insects (R. H. Painter), Biological Control of Insect Pests (C. P. Clausen), Biology of Scarabaeidae (P. O. Ritcher), Insect Eradication Programs (W. L. Popham and D. G. Hall), The Chemistry and Action of Acaricides (R. B. March), Organic Phosphorus Insecticides for Control of Field Crop Insects (W. A. L. David), Insecticides for Control of Adult Diptera (R. W. Fay and J. W. Kilpatrick), Forage Insects and their Control (G. G. Gyrisca), Control of Forest Insects (R. E. Balch), and Transmission of Plant Viruses by Arthropods (K. M. Smith).

Apart from the discourse in each paper, one of the most useful items is the bibliography appended to each, covering literature in most instances to about the middle of 1957. In all nearly 3,000 references are given and the book is one which should be on most entomologists' bookshelves.

E.F.G.

NOTES ON THE BRITISH SPECIES OF THE GENUS *ZYGAENA* FABRICIUS

By W. G. TREMEWAN

Department of Entomology, British Museum (Natural History)

Since the publication of South's British Moths, little work has been done on the British *Zygaena* species. In the following notes I have attempted to settle the status of *Zygaena hippocrepidis* Hübner Stephens nec Hübner, the name having been misused for many years. I have also described a form hitherto unrecognised, and there are changes in the synonymy of two of the species.

Zygaena purpuralis Brünnich.

Sphinx purpuralis Brünnich 1763, Pontoppidan's Danske Atlas, **1**: 686, Pl. 30.

Zygaena pythia Fabricius 1777, *Gen. Ins.*, p. 275.

Sphinx pilosellae Esper 1779, *Die Schmett.* **2**: 186, Pl. 24, Figs. 2a, b.

Sphinx minos Schiffermüller Hübner nec Schiffermüller 1796, *Samml. Europ. Schmett.*, **1**: Pl. 2, Fig. 8.

The type was described by Brünnich from the Isle of Seeland, Denmark.

ssp. **hibernica** Reiss.

Zygaena purpuralis var. *hibernica* Reiss 1943, Seitz Suppl. **2**: 249.

Zygaena achilleae Esper Newman nec Esper 1861, *Zoologist*, **19**: 7565.

Reiss selected the type from a series from Ardrahan, Galway, and included examples from the Clare coast, which are as he had noted, smaller but in other respects quite similar. When he created the name *hibernica* he was under the impression that he was including the form identified by Birchall as *nubigena* Led. This latter form, however, is quite distinct and approaches the Scottish race; because of this I give details of it under that subspecies. The ssp. *hibernica* is thickly scaled, with the streaks and the hindwings scarlet, not crimson; the ground colour of the forewings is blue-black.

ssp. **caledonensis** Reiss.

Zygaena purpuralis var. *caledonensis* Reiss 1931, *Int. ent. Z.*, **25**: 341.

Zygaena nubigena Lederer Birchall nec Lederer 1866, *Ent. mon. Mag.* **3**: 33 (in part).

This subspecies from Western Scotland is rather smaller than *hibernica*; the head, thorax and abdomen are covered with dense black hairs. The wings are thinly scaled with the streaks and the hindwings crimson, not scarlet. The antennae end in short thick

clubs. Specimens from the Isle of Rhum are referable to this subspecies. I have examined a specimen from Eastern Scotland, but hesitate to give an opinion because of the lack of material.

I will now consider the form identified by Birchall as *nubigena* Led. mentioned above. It will be realized that the name is preoccupied as follows:

Zygaena nubigena Lederer Newman nec Lederer 1861, *Zoologist*, **19**:7677.

Zygaena nubigena Lederer Birchall nec Lederer 1866, *Ent. mon. Mag.*, **3**:33 (in part).

It is evident that the older writers found differences in specimens of Irish *purpuralis*. In the *Zoologist* **19**:7676, Newman wrote 'From M. Guenée's letter it appears manifest that that greatest of Lepidopterists considers that the two Irish Zygaenae are distinct as species; the one which we have so long known by the name of Minos, and which is particularly distinguished by its black woolly or hairy body, he believes to be undescribed; and the comparatively recent addition to our fauna, which I announced in the June number, he regards as the true Zygaena Minos'.

This true 'Zygaena Minos' is the one to which Reiss has given the name *hibernica*. Birchall (*Ent. mon. Mag.*, **3**:37) gave the different characters and at the same time considered the Scottish race to be the same as *nubigena*. We have a series from Ballyvaughan, Co. Clare, which answers to his description; as I mentioned above, they are very close, if not identical with *caledonensis*; because of this I hesitate in naming them, and I think it best to refer them to that subspecies. If this determination is correct, the synonymy will fall under *caledonensis*. I think it extraordinary that a form from the West of Ireland should be so close to a race in Scotland, whereas *hibernica* is only a comparatively short distance away. Perhaps a complete knowledge of the life history would solve the problem; there is little difference in the genitalia.

ssp. **segontii** ssp. nov.

The race from Wales is distinct from all others in the British Isles, and as the characters are constant I feel justified in describing it as a good subspecies. Compared with the other races, the first basal streak is shorter. All the streaks are narrower and widely separated, and are together with the hindwings scarlet, not crimson. The ground colour of the forewings is mixed with green. Head, thorax and abdomen slightly hairy. The antennae end abruptly, with blunt tips.

Holotype ♂, 'Abersoch, June, 1902. C. F. Johnson'.

Paratypes, 5 ♂♂ with the same data; 6 ♂♂ labelled 'Cardigan'. In British Museum.

We also have a short series from the Isle of Man, which I cannot place in either of the above subspecies. In these specimens, the hind-

wings are scarlet, as also are the forewing streaks, which are thicker and closer together than in the Welsh race, to which geographically it should be very close. It approaches the Irish *hibernica*, but the antennae end abruptly, the club tapering gradually to the apex.

It had been suggested that *Z. diaphana* Stdgr. ssp. *pimpinellae* Guhn might be found amongst the populations of *purpuralis* in the British Isles. I have examined the genitalia of specimens from all the known localities and find them all to be *purpuralis*. The larva of *pimpinellae* feeds on *Pimpinella saxifraga* L. The type race *diaphana* is from Asia Minor and is replaced by ssp. *sareptensis* Rebel in Sarepta, Russia. The ssp. *pimpinellae* ranges from Sweden, south through Denmark to Germany. For an account of *diaphana* and its subspecies, see this volume of the *Ent. Gaz.*, pp. 183-184.

Zygaena exulans Reiner and Hohenwarth.

Sphinx exulans Reiner and Hohenwarth 1792, *Botan. Reisen*, p. 265, Pl. 6, Fig. 2.

The type was described from Gross Glockner, in the Alps.

ssp. **subochracea** White.

Zygaena exulans var. *subochracea* White 1872, *Scot. Nat.*, **1**: 174.

This race from Scotland approaches ssp. *vanadis Dalman*, and has not been considered distinct by some authors. However, the marginal border of the hindwings is usually wider and more distinct in the Scottish race.

Zygaena loti Schiffermüller & Denis.

Sphinx loti Schiffermüller & Denis 1775, *Wien. Verz.*, 45.

Zygaena fulvia Fabricius 1777, *Gen. Ins.*, 275. **syn. nov.**

Sphinx lonicerae Scheven Fuessly nec Scheven 1778, *Mag.* **1**: 140, Pl. 1, Fig. 4.

Sphinx achilleae Esper 1781, *Die Schmett.*, **2**: Pl. 25, Figs. 1a, b.

Sphinx amsteinii Scheven 1782, in *Fuessly's Neues Mag.*, **1**: 54.

Sphinx viciae Schiffermüller Hübner nec Schiffermüller 1796, *Samml. Europ. Schmett.*, **1**: Pl. 2, Fig. 11 (corrected to *loti* in text, p. 79, 1805).

This species has long been known under the name of *achilleae* Esper, but Verity (*Mem. Soc. ent. ital.*, **9**: 18) was the first to synonymise Esper's *achilleae* with *fulvia* Fabricius. However, in the *Ent. Rec.*, **32**: 29, which is ten years earlier, he concludes that *loti* Wien. Verz. is the specific name of *transalpina* Esp. I do not accept this, and apparently it was a misidentification of Esper, whose figure, referred to as 'loti d. Ther.', does not agree with his *achilleae*.

Werneburg (*Beiträge zür Schmett.* 1864) synonymises *fulvia* Fab., with *loti* Wien. Verz. I accept this because Fabricius visited Vienna in 1784, and stated in his autobiography that the principal object of this tour was to form an aquaintance with the authors of the 'Verzeichness der Schmetterlinge der Wiener Gegend', and to inspect the collections, which to him were highly important. If Fabricius were

in doubt, or had made an error, he would have corrected it in his *Mant. Ins.* 1787, where he still refers his *fulvia* to *loti* Wien. Verz.

ssp. **scotica** Rowland-Brown.

Zygaena achilleae ssp. *scotica* Rowland-Brown 1919, *Entomologist*, **52**: 225.

Zygaena fulvia ssp. *caledoniae* Verity 1930, *Mem. Soc. ent. ital.*, **9**: 21.

Zygaena achilleae ssp. *caledonica* Reiss 1931, *Int. ent. Z.*, **25**: 341. **syn. nov.**

Rowland-Brown suggested the name *scotica* for the Scottish race in 1919, since when two more names have been created; these have to fall as synonyms.

Zygaena viciae Schiffermüller & Denis.

Sphinx viciae Schiffermüller & Denis 1775, *Wien Verz.* **45**.

Sphinx meliloti Esper 1793, *Die Schmett.* **2**: Pl. 39, Figs 1-8. **syn. nov.**

Sphinx lonicerae var. Scheven Esper nec Scheven, *Die Schmett.* **2**: Pl. 25, Fig. 3.

Sphinx loti Schiffermüller Hübner nec Schiffermüller 1799, *Samml. Europ. Schmett.* **1**: Pl. 17, Fig. 82 (corrected to *viciae* in text, p. 80, 1805).

Zygaena buglossi Duponchel 1835, *Hist. Nat. Lep.*, Suppl. **2**: 138.

In bringing forward *viciae* S. & D. as the correct name, I have followed Werneburg, who considered this to be correct. The older authors, such as Hübner, Ochsenheimer, etc., recognized *viciae* S. & D., and *meliloti* Esp., as being one and the same. Tutt (*Brit. Lep.* **1**: 453) cites Schrank ('1785', *sic*), whose description in *Fuessly's Neues Mag.* 1784 was made from the insect in the Vienna collection, as the author.

ssp. **anglica** Reiss.

Zygaena meliloti var. *anglica* Reiss 1931, *Int. ent. Z.*, **25**: 344.

The New Forest race is distinct from those on the Continent, and confluency of the spots is much more frequent. The name *ytenensis* Briggs has also been used to describe this race, but I consider this name to be a synonym of *Z. trifolii* Esp.

Zygaena filipendulae Linnaeus.

Sphinx filipendulae Linnaeus 1758, *Syst. Nat.*, 10 ed., p. 494 (with reference to *Fauna Suecica*, p. 256, 1746).

Sphinx filipendula (*sic*) [L.] Poda 1761, *Ins. Mus. Graec.*, p. 82.

Adscita aries Retzius 1783, *Gen. Spec. Ins.*, p. 35.

The form from Rhum and Sanday, Inner Hebrides, approaches the type race, which is from Sweden.

ssp. (? ab.) **lismorica** Reiss.

Zygaena filipendulae var. (? ab.) *lismorica* Reiss 1931, *Int. ent. Z.*, **25**: 345.

The description is based on specimens from the Isle of Lismore, Scotland. Whether this is a true subspecies or an aberration I do not know; specimens from the series I have examined are quite distinct, with dull red spots and hindwings, and not the usual scarlet and crimson.

The Southern English form, compared with the type race, is thickly scaled, with the forewings shining brassy green or blue-green; the spots and hindwings carmine.

We now have the question of *Zygaena hippocrepidis*, which for years has caused considerable confusion. The name was created by Hübner (*Europ. Schmett.* 1805) when he figured a form of *transalpina* Esper. It is apparently an unusual aberration of this species. Ochsenheimer then included it in his list (*Schmett. Europ.* **2**: 63, 1808), referring it to Hübner's *loti*.

Stephens described a form under this name (*Illus. Brit. Ent.*, 1828) attributing the name to Ochsenheimer, and a yellow aberration, saying of the latter that he had taken three specimens only. Wood (*Index. Ent.*, 1839) recorded it with an illustration of the yellow aberration, Pl. 4, Fig. 6a. However, he referred the name to Stephens, apparently realizing that the *hippocrepidis* of Hübner and Ochsenheimer was a different species.

Tutt (*Ent. Rec.*, 1897, 103) discusses it rather fully. He correctly states that it is not the *hippocrepidis* of Hübner and Ochsenheimer, which he says is generally accepted as a var. of *transalpina* Esp. He quotes Stephens as the author, and refers to Wood. He then describes a colony of *trifolii* in Kent—'in a certain field in Kent, some ten years ago, what is known as the small form of *Zygaena trifolii* was taken very abundantly during the first week in June. These specimens were very characteristic, many of them being strikingly blotched; but occasionally an odd specimen was taken with six, instead of five, spots on the forewings. The species afterwards got very rare, and of the specimens captured at least 50 per cent. had six spots, although still retaining the small size and general characters of the old five-spotted form. Two of the five-spotted specimens captured in 1892 had their forewings taken off and their bodies forwarded to Mr. Pierce, of Liverpool, who examined the genital organs and returned them as undoubted *Z. filipendulae*. Knowing their life history completely I felt satisfied that these represented the development of a race of six-spotted *Z. trifolii*. There were two suggestions open; (1) that we have a separate species occurring in late May and early June distinct from both *Z. filipendulae* and *Z. trifolii*, which (like some of the Continental species) may be either five- or six-spotted; (2) that *Z. filipendulae* and *Z. trifolii*, although distinct enough in most localities, are in others in such a transition state that they have the inherent ability to change from one form to the other under certain conditions. The ease with which Mr. Fletcher had hybridized the species seems to point to the latter as a more probable conclu-

sion'. He then says that the six-spotted form had almost superseded a family of early *trifolii,* and there were various records of small six-spotted Zygaenas being taken in early June, and that these referred to the specimens described by Stephens as *hippocrepidis.* If Tutt had seen the series in the Stephens' collection he would not have misnamed the specimens from the Kent colony, which are distinct from those in the Stephens' series.

I am inclined to agree with the first statement made by Tutt. Five-spotted *filipendulae* are known on the Continent, why not in this country? However, I cannot accept his second statement that the two species could change from one to the other at will or under certain conditions.

Fortunately we have the Tutt series in the British Museum; there are 108 specimens, taken May-June, some of them bearing the actual dates, 25th May-24th June. Some are labelled 'flying with trifolii'. There is also a note in the cabinet stating the occurrence of the six-spotted form superseding the five. In all probability his '*trifolii*' were all five-spotted *filipendulae.*

We also have the genitalia slide of one of the specimens Tutt sent to Pierce, and it is not *trifolii.* The slide has two labels; on the first is written—'slide sent in for identification minus forewings. Zygaena filipendulae ♂ 1536'. On the other label is written—'J. W. Tutt, 1892', and what appears to be 'No Lon', the meaning of which I do not know.

In 1885 Boden (*Entomologist,* **18**: 317) stated he had seen examples of *Z. ochsenheimeri Zell.* at one of Stevens' sales, in drawers of European lepidoptera, and that he had taken it in the metropolitan district for several years. I have traced three of these specimens and find them to be conspecific with those in the Tutt series, and as they are labelled 'Kent, 1879', they probably came from the same colony.

Now we have: (1) *Z. filipendulae hippocrepidis* Hübner Stephens nec Hübner, named *stephensi* by Dupont (*Bull. Soc. des Sciences Nat. d'Elbeuf,* 1900, p. 77). I treat this form as a generatory variety, in the category 'forma tempestatis'; I will discuss this more fully later;

(2) *Z. filipendulae hippocrepidis* Hübner Tutt nec Hübner which I am naming *degenerata* Tremewan f. loc. nov. I have classed this insect as *f. loc.* = *forma alicuius loci,* which is a form restricted to one portion of the range of the species.

f. loc. **degenerata** f. loc. nov.

Zygaena filipendulae var. *ochsenseimeri* Zeller Boden nec Zeller 1885, *Entomologist,* **18**: 370.

Zygaena hippocrepidis Hübner Tutt nec Hübner 1897, *Ent. Rec.,* **9**: 87.

♂ 23-32 mm. Forewings blue-green, not infrequently brassy-green, with six crimson spots; spot six often small and ill-developed, represented by a few crimson scales only, or more rarely absent. If absent,

represented on the underside by a few crimson scales. Hindwings crimson, with a broad blue-black marginal border, broadest at the apex and middle of the termen.

♀ 27-35 mm. Forewings blue-green or brassy-green, with six crimson spots. Spot six usually well-developed, especially on the underside. Hindwings pale crimson, with narrow marginal border, rarely broad, blue-black in colour.

There is marked sexual dimorphism, males approaching *trifolii* in some features; females similarly approaching *filipendulae*.

Variation. ♂. As mentioned above, spot six sometimes absent, but usually represented by a few crimson scales. Confluency in spotting rare, but occasionally spots three and four combined. One example with spot four absent, and spot six composed of a few crimson scales on left forewing; right forewing normal.

♀. Spots three and four combined in one specimen; apart from this very little variation except in size.

I might mention that the type of ab. *pallida* Tutt, which is in the British Museum, is pale due to the action of weather, the sun having bleached the crimson to pink on the forewings, although the hindwings are naturally pink.

Genitalia. ♂. Rather smaller than in *filipendulae*, otherwise very little difference. ♀. Sternite IX narrower at the base, tapering evenly to the apex; in *filipendulae* usually short and broad. In the bursa-copulatrix, signum represented by a small number of spines, and in one specimen one spine only. In *filipendulae*, a very large number, although varying.

Life history. Tutt received from South a hibernating larva, upon which his description was based. However, as South was in a complete muddle over the Zygaenidae, I hesitate to accept it. Tutt received the description of the pupa and cocoon from Chapman.

Distribution. The colony in Kent, whence came the Tutt series. I think that all other records should be regarded with suspicion because of the confusion that existed between this form and *stephensi*.

Holotype ♂, 'Kent, 25.v.-24.vi.1892. J. W. Tutt', Allotype with same data.

Paratypes. All labelled 'Kent', with the following dates 4 ♂♂ '1884', 7 ♂♂ '19.vi.1890', 70 ♂♂ '25.v.-24.vi.1892', 15 ♀♀ '25.v.-24.vi.1892', and 1 ♀ '20.v.1893'. In British Museum.

f. t. **stephensi** Dupont.

Zygaena stephensi Dupont 1900, *Bull. Soc. d'Etude des Sciences Nat. d'Elbeuf*, p. 77.

Anthrocera hippocrepidis Hübner Stephens nec Hübner 1828, *Illus. Brit. Ent.*, **1**: 109.

Zygaena filipendulae v. (? ab.) *tutti* Rebel 1901, in *Staudinger and Rebel's Cat. Lep.*

I think it best to first consider the original description: 'This varies in size like An. Filipendulae, which it greatly resembles; but the border of the posterior wings is considerably more distinct than in that insect, and undulated internally: the sixth spot on the anterior wings (the one towards the anal angle) is generally small, with a coloured nervure passing through it; the under surface of the anterior wings with the disc entirely red, and the maculations not defined. Above, the anterior wings are blue-black, with six red spots, disposed as in An. Filipendulae, and the posterior red, with an undulated greenish-blue margin: the abdomen immaculate.'

It will be realized that this description can be applied to true *filipendulae* that are found in July and August. I have examined the Stephens' series of *hippocrepidis* and can find little difference from *filipendulae*; the genitalia agree. There are eight specimens, 7 ♂♂ and 1 ♀. As a type was not selected by Stephens; a lectotype has been selected from this series.

In 1891 South (*Entomologist*, **24**: 233) wrote a paper on the variation of *Zygaena filipendulae*, and included *ochsenheimeri* Zell. Of the latter he mentioned Boden as having taken it, and that he himself had taken examples at Folkestone at the end of July, which have the spot intersected, but the colour did not agree with typical *ochsenheimeri*. Then in 1897 (*Entomologist*, **25**: 181) he wrote on *hippocrepidis*, stating that he had taken it 12th June on the Hertfordshire-Middlesex border. In this note he ignores *ochsenheimeri* Zell. I have examined these specimens, which are now in the Birmingham Museum. There are five specimens taken in June, 1892, and twenty taken in June, 1897, all from Northwood.

In 1901 another name was created, that of *tutti* Rebel; this now falls as a synonym.

It has been suggested that *stephensi* is an early brood which is then capable of producing normal *filipendulae* in July and August. This does not seem possible, as there is not sufficient time for the larvae to feed up and pupate. Mr. Edelsten, who kindly showed me specimens from his collection, suggested that possibly the larvae hibernate for two winters, the resulting imagines emerging in June; larvae of *Zygaenid* species have been known to do this, and perhaps this is the explanation. In other words, there may be some unknown factor which causes the larvae of the whole brood to hibernate. I am not suggesting that all *filipendulae* taken in June may be classed as *stephensi*, as early 'normal' specimens are often found at the end of June, but only when the whole brood is affected, and is over when the 'normal' *filipendulae* is fully out. I tentatively class this insect as a generatory variety, in the category f. t. = *forma tempestatis*, in other words, seasonal.

Lectotype ♂ in Stephens' collection. In British Museum.

Zygaena lonicerae Scheven.

Sphinx lonicerae Scheven 1777, *Naturf.*, **10**: 97.

Sphinx graminis de Villers 1789, *Ent. Linn.*, **2**: 115.

According to Reiss the type is from Regensburg. The normal form in England is quite typical, although specimens from the chalk hills of Buckinghamshire and Bedfordshire are much brighter, with the usual crimson replaced by carmine.

ssp. **latomarginata** Tutt.

Zygaena lonicerae var. *latomarginata* Tutt 1899, *Brit. Lep.*, **1**: 468.

Compared with the typical form, this race from the coast of Yorkshire is larger, with broader forewings; the hindwings have a wide blue-black border, extending along the costa. I have compared it with ssp. *major* Frey, from the Continent, and find that it is not so large.

A large race is said to occur at Mullinures in Armagh, but I have not seen material from this locality.

Zygaena trifolii Esper.

Sphinx trifolii Esper 1783, *Die Schmett.*, **2**: Pl. 34, Figs. 4, 5.

Sphinx pratorum de Villers 1789, *Ent. Syst.*, **2**: 114 (with reference to Ernst 1779, *Pap de Eur.*, **3**: Pl. 97, Fig. 136).

Sphinx loti Schiffermüller Wood nec Schiffermüller 1839, *Index. Ent.* p. 11 (corrected to *trifolii* in errata).

Zygaena meliloti Esper Briggs nec Esper 1888, *Young Nat.*, **9**: 82.

Zygaena trifolii ssp. *ytenensis* Briggs 1888, *Young Nat.*, **9**: 82 (with reference to *meliloti* in error). **syn. nov.**

Zygaena trifolli-minor Tutt 1899, *Brit. Lep.*, **1**: 480.

According to Reiss, the type race described by Esper originated from Frankfurt. The form found in England at the end of May and in June is considered to be typical.

The name *ytenensis* Briggs has been considered by some authors to be the subspecific name for the New Forest *viciae*. I do not accept this and consider it to be a synonym of *trifolii*. Briggs stated that his brother had bred *trifolii* from *meliloti* and he considered the latter species to be a degenerate form of *trifolii* peculiar to the New Forest. In my opinion his parent '*meliloti*' were worn *trifolii*. Specimens of the latter species that I have examined from the New Forest are rather small and, if worn, might well be mistaken for *meliloti*.

ssp. **palustris** Oberthür.

Zygaena trifolii-palustris Oberthür 1896, *Etudes d'Ent.*, p. 45, Pl. 8, Figs. 151-153.

Anthrocera meliloti Esper Stephens nec Esper 1828, *Illus. Brit. Ent.* **1**: 107.

Anthrocera loti Schiffermüller Stephens nec Schiffermüller 1828, *Illus. Brit. Ent.*, **1**: 109. (in part).

Zygaena trifolii-major Tutt 1897, *Ent. Rec.*, **9**: 88.

This is the race found in July and August, usually in marshes, although I met with a colony situated on dry grass-covered cliffs in North Cornwall.

Verity (*Ent. Rec.*, **37**: 101, 1925) considers *trifolii* and *lonicerae* to be one species, and treats them as subspecies, or more strictly *exerges;* the latter term meaning two groups not distinct enough to be sterile if crossbred, yet distinct from each other in the natural state, by hereditary characters. He states that the male genitalia are identical, with which I agree, but he omits that there are differences in the female genitalia, notably in the lower dorsal pouch and the ductus bursae; these characters are, however, subject to variation. At present I consider *lonicerae* and *trifolii* to be two distinct species.

Verity's paper is continued in the *Ent. Rec.*, **38**: 1926, where the following names are proposed: race *palustrella* Verity, for material from a colony in Surrey. On page 57 he proposes race *decreta* Verity, and describes a dwarf form collected by Grosvenor in Sussex. He then states that the series exhibits a wonderful degree of variation, some being like *transferens* Verity, and finally 3 ♂♂ and 1 ♀ having more marked *lonicerae* characters than any others he had seen from the British Isles. These are described as *misera* Verity. Race *transferens* Verity is proposed for material from Tring, Hertfordshire, which he considers to be intermediate between *lonicerae* and *trifolii*.

Race *brittaniae* Verity is proposed for specimens from Warthill, Yorkshire, which he places under ssp. *lonicerae*.

It is apparent that these names cannot be ranked as subspecific, and I consider them to be purely aberrational.

ACKNOWLEDGMENTS

I would like to express my thanks to Mr. J. L. Campbell of Canna for information on the species occurring in the Hebrides; to Mr. L. Bilton, Keeper of Natural History in the Birmingham Museum, for enabling me to see the *Zygaenidae* in the South collection; and to Mr. E. Taylor, of the Hope Department, Oxford, who kindly sent *Zygaenid* material to me on loan. Also to Dr. Skat Hoffmeyer, of Aarhus, Denmark, for sending me information on *Z. diaphana* ssp. *pimpinellae*, and finally to my colleagues in the British Museum, especially to Mr. D. S. Fletcher for help with the synonymy.

ODONATA AT LIGHT

On the morning of 28th August, 1958, I found a female specimen of the dragonfly *Aeshna grandis* (L.) in my mercury vapour light trap at Feltham, Middlesex. The trap was put in operation just before dusk on the 27th.

E. W. CLASSEY.

Feltham, Middlesex.

THE TRANSPARENT BURNET MOTH, *ZYGAENA PURPURALIS* (BRÜNNICH)

By THE RIGHT REVEREND SKAT HOFFMEYER, D.D., C.D., M.D. F.R.E.S.

In the *Proc. S. Lond. ent. nat. Hist. Soc.*, 1956, p. 141 (1957) Mr. H. C. Huggins reports on the Burren colony (Ireland) of *Zygaena purpuralis* (Brünnich). He calls *purpuralis* 'this unhappy insect', thinking there is 'still some doubt if it be the true *purpuralis* of Brünnich', of which 'the type was unfortunately destroyed during the bombardment of Copenhagen in 1801'.

I beg leave to use this occasion to quote Brünnich's description. It is given in his *Prodromus insectologiae siaellandicae* (Sjaelland-Seeland) 1761, p. 29, No. 18. It is in Latin and perfectly clear, as far as it goes:

> 'Sphinx of the stature of *Sphinx filipendulae* with spiral tongue, forewings sea-green (cyaneis), with three red lines in each wing, one hardly from the base of the wing forms (facit) a part of the exterior border, the second longer also from the base reaches to (tenet) the middle, the third begins between those two, a little before the first ends, and proceeds widening, not quite to the border of the wing. Hindwings red unspotted.'

Two years later, in 1763, he figured his insect in *Pontoppidans Danske Atlas* (a famous all-round description of Denmark) Vol. 1, plate 30. I have copied his figure on plate X and I would like to underline: (1) the bulbed antennae, and (2) the locality given in the title of the book two years before: Seeland. From these facts there should not be any doubt that Brünnich's name is valid.

Nevertheless, one hundred and eighty years later new clouds seem to threaten the happiness of Brünnich's insect. Late in the year 1940 the German entomologist H. Reiss, in *Stett. ent. Zeit.*, published his discovery that the *purpuralis* of Brünnich in Central Europe was a twin species (like *Heliothis dipsacea* and *maritima*; *Ortholitha mucronata* and *plumbaria*, etc.). For the 'twin' he used the name *Z. pimpinellae* (Guhn). The chief distinction between the two species were the following: a slight difference in the red colour: *pimpinellae* carmine, *purpuralis* slightly yellow tinted; the hairs of the male antennae longer in *pimpinellae*; differences in the genitalia, not too great in the males, the uncus tips more pointed in *pimpinellae*; but remarkable and well defined in the females, in *pimpinellae* the post-vaginal plate (P on the plate) being rather small, but the ante-vaginal plate (A) much broader, stronger and more chitinised than in the 'old' species. And, most astonishing, there was a curious biological difference between the two. The larva of *pimpinellae* was grey or dirty white and feeding on Burnet Saxifrage (*Pimpinella saxifraga*), that of *purpuralis* yellow and feeding on Thyme (*Thymus*). If you offered

purpuralis larvae only saxifrage they would die of starvation, and vice versa.

Reiss was in possession of some Danish material, which he had obtained from the Zoological Museum in Copenhagen, and all his specimens from Denmark were the thyme feeding species. So Reiss concluded that Brünnich's name belonged to this species.

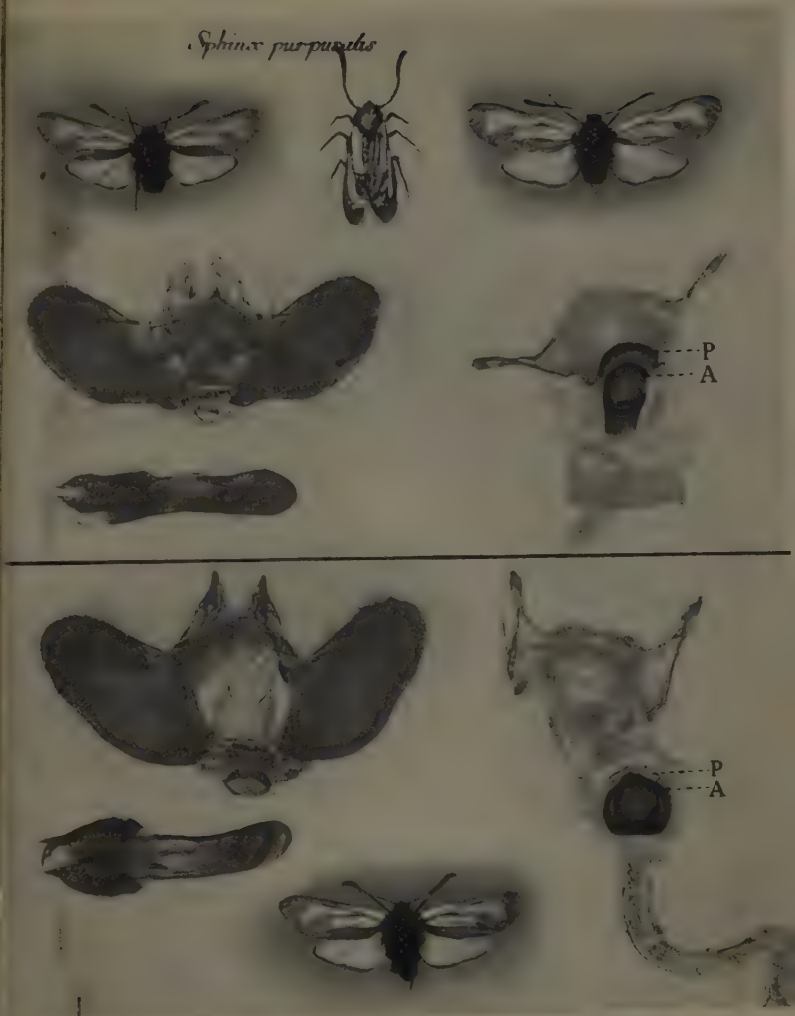
However, on reading Reiss's article I realised that I had seen '*purpuralis*' larvae on both plants. My friend, Mr. S. Knudsen, and I checked the male antennae and the genitalia of a good many specimens. I must say we had our difficulties. You know how it is with the Burnets, in the collection, when dry they are inclined to drop their antennae and abdomens. A bang with the drawer will suffice. Then you start glueing. The results will not always stand a scientific test. At times Mr. Knudsen and I felt quite unhappy. Mr. Knudsen might have a male antenna of *pimpinellae* and I had a female *purpuralis* abdomen of the same specimen! Well, the whole party ended in the relaxing bottle, where the false parts went down, and our happiness was restored. Without doubt we established both species as Danish. Besides we also had the two colour forms of the larvae in the collection of blown larvae in the Natural History Museum, Aarhus.

In this way we were confronted by a rather unhappy question, to which of the two species had Brünnich attached his name *purpuralis*? I asked Prof. Spärck of Copenhagen if any type specimens were still in existence in the Zoological Museum there. The professor said no, after the bombardment of Copenhagen in 1801 Brünnich's collection had been kept for years under unfavourable conditions, and nothing was left.

This again was very unhappy, but in this case rather a relief. It would have been a bit silly if the result had been that the true *purpuralis* was a pimpinella feeder—what then of *pimpinellae*? But could we depend on Reiss's contention that only the thyme feeding species occurred on Brünnich's island?

Of course, Brünnich's description and figure cover both species. The difference in the red colour would not be of any help, his figure being uncoloured. And, by the way, we were not able to see any colour difference in the Danish populations. Still, there is a point of some importance. In both species the red marking of the forewings ends with something like a hammer head. In most *pimpinellae* this hammer head points towards the border of the wing, in most *purpuralis* it points towards the corner of the wing. This is not at all a sure mark of distinction, the two species being very variable on this point. However, it will be seen that Brünnich's figure is quite in accordance with what I have hitherto called *purpuralis*, the thyme feeding species.

It may still be an open question whether the other insect should be considered a 'good' species or merely a variety, geographical race or an ecological form. In an article in the Danish periodical *Flora og Fauna*, 1941, Mr. Knudsen and I figured a male specimen which was,



Top.—'This unhappy insect' *Zygaena purpuralis* (Brünnich) ♂ and ♀ with genitalia and Brünnich's own figure from 1763.

Bottom.—'This other insect' *Zygaena pimpinellae* (Guhn) with genitalia.

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both in the antennae and in the genitalia, an absolute intermediate. It might be a hybrid. But it was from Funen, where *pimpinellae* has never been found, and where *purpuralis* now seems to be extinct. There is also the question of other foodplants. I have written as if thyme and saxifrage were the only possibilities in question, but this may not be so.

I have been using the term 'species' for convenience's sake, nevertheless it seems to me unlikely that two forms with such, on the whole, definite differences in structure and biology would occur side by side, as they certainly do in some places in Seeland, without being two distinct species.

All this happened during the war, of course, and we were cut off from Britain. During my first visit to Britain after the war, early in 1946, I asked some friends about it. Dear old Prof. d'Arcy Thomson in St. Andrew's said '*Purpuralis*? No, I don't know him, but hasn't he had another name?' 'Yes,' I said, 'when you were a boy it was called *pillosellae* (Esper.)'. 'I have him', he said, and he had him! But I was occupied with theology in St. Andrew's, and could not spare time for the burnets. Later, in Tring, I asked my old friend Dr. Cockayne, but he interrupted me smiling and said 'I do not think we have this other insect in Britain.'

Later again, in 1948, Dr. de Worms kindly sent me two specimens from Abersoch, Wales. I dissected them, *p* , well, ask him, or ask Mr. W. G. Tremewan of the British Museum (Natural History); I know he is working on the British burnets.

In 1948 too I published my book *De danske Spindere*. There I reproduced the results from the article in 1941 with some of the figures reduced in size. Only there was this difference: following the German entomologists I called *pimpinellae sareptensis* (Staudinger), this according to the Germans being an older name for the pimpinella-feeding species. I deplore that I did not keep the name *pimpinellae* (Guhn). This is—leaving 'the rules' alone—a more appropriate name.

Neither of the two species is found in Jutland where I live. *Z. purpuralis* is known from Seeland, Mön, Falster and Funen (now extinct); *pimpinellae* is known from Seeland. Locally, both species are fairly common, in the usual way of burnets.

Now I come to the latest discoveries. In the spring of 1957 two Swedish entomologists asked my opinion about specimens from southern Sweden. One of them sent me unset specimens in an ordinary letter. They were crushed, of course, but it is always nice when somebody confides in you. I found that they were all *pimpinellae*, and there was no trace of the true *purpuralis*.

In the autumn the other Swede, Mr. J. Swensson, published the results in *Opuscula Entomologica*, and so far only *pimpinellae* (Guhn) has been found in Sweden.

So, you see, if *purpuralis* had been described by the great Swedish naturalist Linnaeus it would really have been an unhappy insect.

Now I hope that this article may restore its happiness. Wild thyme is a lovely plant, and it is not at all unhappy to be a twin.

As to 'this other insect' *pimpinellae* I am sure that it would gain in happiness if it could be found in Britain.

Contribution from the Natural History Museum, Aarhus.

BOOK REVIEW

Studies on the Comparative Ethology of Digger Wasps of the Genus Bembix, by Howard E. Evans, New York, 1957. Comstock. pp. vii; 248. 51 figs. Wrappers. Price £1 17s. 6d.

The Sphecid sandwasps of the genus Bembix are of special interest because the females of most species feed their larvae progressively. At any rate when young the Bembix larva is fed from time to time by its mother with fresh flies, whereas, among the sandwasps generally, the female, after laying an egg, provisions her cell with as much food as the larva will need for its complete growth. Bembix, because of having advanced beyond this stage by exhibiting maternal features that reach their fullest development amongst the social wasps, is considered to represent the culmination of a major line of evolution within the Sphecidae.

Dr. Evans has made an extensive study of the habits of 13 species of N. American Bembix, noting the phases through which the adult insects pass from the time of emergence from their underground cells to the completion of their nests. Such matters as the nuptial flight of the males, the female's method of constructing her nest, and how later she hunts and provides flies for her offspring have been observed with a carefulness deserving of the highest praise.

From his observations Dr. Evans shows to what degree the behaviour of the different species studied departs from the pattern common to the genus. By analysing such characters as whether the female of a species levels the sand at the mouth of her burrow on nest completion, whether the egg is glued erect on the first fly to be brought in or laid on the floor of a still empty cell, he divides the aspects of a species' behaviour into two groups that are either specialised or primitive. He is thus able to suggest an evolutionary line of behaviour. Dr. Evans puts forward his phylogenetic arrangement of the species with modesty, making no greater claim for its acceptance than that it takes into account all the known facts of the behaviour of Bembix and in no way conflicts with the conclusions reached by other workers.

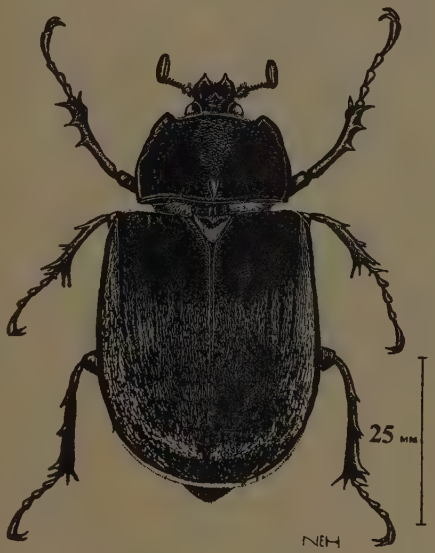
It is clear that the author of this field study is a patient and most careful observer. Nowhere is there a hint of that anthropological slant that blurs the observational accuracy of so many entomologists who work with the living insect.

This is a work of much significance and will rank as an outstanding contribution to our knowledge of the habits of the sand wasp.

G. E. J. Nixon.

ALIEN INSECTS FOUND ALIVE IN BRITAIN—5-6

By N. E. HICKIN



5. *Megasoma gyas* Herbst.

The specimen illustrated was shown, set and carded, at a meeting of the Royal Entomological Society in London on 2nd November, 1949, and made history by unshackling its tarsi of gum and walking off the card! It was referred to in *Proc. R. ent. Soc. Lond.* (C) **14**: 42 as a *living* female adult. The specimen together with a larva was collected by Mr. M. G. Fraser on 19th October, 1949, at Seaforth, Lancs, from Brazilian Rosewood. This timber species—*Dalbergia nigra*—is a hard, heavy, durable wood, but the heartwood is often decayed thus accounting for the presence of this member of the SCARABAEIDAE. Surely this species is the bulkiest beetle ever to have been accidentally introduced into Britain.

6. Cerambyx cerdo Linn.

This large Cerambycid beetle finds its way to this country from time to time in consignments of Oak from Europe. It is sometimes found in situations where the circumstantial evidence leads to supposing that it has emerged from a British-grown oak. The specimen illustrated was found alive in a stack of English grown oak in the yard of W. Mallinson and Sons Ltd., Old Ford, London, E.3., on the 25th June, 1952.

THE DIPTERA OF JERSEY, CHANNEL ISLES

By KENNETH G. V. SMITH
(Hope Dept. of Entomology, Oxford)

The previous list of Jersey Diptera (Luff, 1908:509-11) included only 69 species, several of which needed verification. Recently Mr. G. G. E. Scudder collected on the island and kindly suggested that I might like to work through his material with the view to publishing a revised list of Diptera. Dr. W. J. Le Quesne has also placed his captures at my disposal for this purpose. The earlier records of Luff and others are included for the sake of completeness, and in the present paper 220 species are listed. The small non-British element in the Dipterous Fauna occurs in St. Ouen's Bay, and Dr. Le Quesne informs me that this is so with other orders. Representatives of most of the species here recorded have been placed in the Museum of the Société Jersiaise,, some specimens have been presented to the Hope Department by Mr. Scudder and Dr. Le Quesne, and a few are in the author's collection. Comments on species of special interest are made in the following list. My thanks are offered to the following colleagues for determinations in their special families as follows: Messrs. C. N. Colyer (Phoridae), K. A. Spencer (Agromyzidae), E. Taylor (Tipulidae), and Dr. F. I. van Emden (Muscidae).

The following abbreviations are used for collectors and recorders:

(ACH) = A. C. Halliwell (specimens in Jersey Museum).
(LF) = W. A. Luff (1908, see references).
(LQ) = W. J. Le Quesne.
(S) = G. G. E. Scudder.

TIPULIDAE

Tipula maxima Poda. Not uncommon (LF).
T. rufina Mg. (LF).
T. oleracea L. Common (LF); St. Ouen's Bay, 21.iv.57 (S).
Nephrotoma submaculosa Edw. St. Ouen's Bay, 21.iv.57 (S).
Dolichopeza albipes Stroem. St. Ouen's Bay, 21.iv.57 (S).
Limonia nubeculosa Mg. St. Brelade, 13.iv.47 (LQ).
L. (Dicranomyia) chorea Mg. Grève d'Azette, 12.iv.55 (LQ).
L. (Rhipidia) maculata Mg. La Coupe, 22.iv.57 (S).

TRICHOCERIDAE

Trichocera annulata Mg. Bagatelle Lane, 22.i.48 (LQ); Belozanne Valley, 21.i.48 (LQ).
Trichocera sp. St. Peter's Valley, 23.xii.47 (LQ).

ANISOPODIDAE

Anisopus fenestralis Scop. Grève de Lecq, 27.iii.48 (LQ).

PTYCHOPTERIDAE

Ptychoptera albimana (F.). St. Peter's, 29.iii.46 (LQ).

CULICIDAE

Theobaldia annulata (Schrk.). Common (LF); Mont à l'Abbé, 8.ix.46 (LQ); Beaumont, 29.ix.46 (LQ).

Culex pipiens L. Common (LF); St. Helier, 2.x.46 (LQ).

CHIRONOMIDAE

Clunio marinus Hal. Common, hovering over rock pools at about half-tide (LF).

Chironomus plumosus (L.). Common (LF).

BIBIONIDAE

Bibio leucopterus Mg. Handois, 23.iv.57 (S); St. Catherine's, 27.iv.57 (S).

B. marci (L.). Common in the spring (LF); Gorey, 18.iv.57 (S); Noirmont, 19.iv.57 (S).

B. hortulanus (L.). Le Bourg, 2.v.43 (LQ); Pontac, 24.iv.57 (S).

B. laniger Mg. St. Brelade, 11.iv.55 (LQ).

B. johannis L. St. Ouen's Bay, 17.iv.54 (LQ).

B. varipes Mg. v. *hybridus* Hal. Rozel, 10.iv.55 (LQ); St. Brelade, 18.iv.54 (LQ).

Dilophus febrilis (L.). Noirmont, 19.iv.57 (S); Grève d'Azette, 20.iv.57 (S); Grands Vaux, 21.iv.57 (S); Pontac, 24.iv.57 (S).

SCATOPSIDAE

Scatopse notata (L.). St. Helier, 29.iii.48 (LQ); La Coupe, 22.iv.57 (S); Rozel 19.iv.54 (LQ).

MYCETOPHILIDAE

Isoneuromyia biumbrata (Edw.). Tesson Mill, 4.x.57 (LQ), hitherto only known from Cornwall and Dorset (England) (vide Edwards, F.W., 1913).

Macrocera stigma Curt. St. Ouen's Bay, 21.iv.57 (S).

Mycetophila ocellus Walk. Bagatelle Lane, 22.i.48 (LQ).

Sciara thomae (L.). GrandsVaux, 25.vii.47 (LQ); St. Martin, 30.viii.57 (LQ).

S. (*Bradysia*) *carbonaria* Mg. Pontac, 24.iv.57 (S).

Sciara spp. Tesson Mill, 23.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S); also Rozel, St. Brelade (LQ).

STRATIOMYIDAE

Microchrysa polita (L.). Pike, 3.vi.33 (3 specimens in the Jersey Museum).

Chloromyia formosa (Scop.). In June and July. Not uncommon (LF); Pike, 3.vi.33 (specimen in Jersey Museum); Le Bourg, 3.viii.48 (LQ); St. Ouen's Bay, 22.vii.53 (LQ).

Geosargus cuprarius (L.). Two, 10th July (LF).

Oxycera pulchella Mg. (LF).

RHAGIONIDAE

Rhagio lineola F. Captured by Mr. E. Saunders, June, 1903 (LF).

Chrysopilus aureus Mg. Not uncommon (LF).

TABANIDAE

Tabanus autumnalis L. (LF); St. Ouen's Pond, 7.viii.48 (LQ).
Haematopota pluvialis L. Grouville, 31.viii.54 (LQ).

CYRTIDAE

Acrocera globulus Pz. Les Platons, 27.vii.55 (LQ).

BOMBYLIIDAE

Villa paniscus (Rossi). June, 1908, St. Peter's Valley (LF).
Anthrax velutina Mg. This non-British species is rather common at St. Ouen's Bay in June and July (LF).

THEREVIDAE

Thereva annulata F. Common on sandhills near St. Ouen's Bay (LF); Blanches Bouques, 23.viii.47 (LQ); Jersey, May, 1934 (ACH); St. Ouen's Bay, 17.iv.54 (LQ); 21 and 25.iv.57 (S).
T. nobilitata (F.). Specimens captured by Mr. E. Saunders, June, 1903 (LF).

ASILIDAE

Leptogaster guttiventris Zett. St. Ouen's Pond, 14.vii.47 (LQ); Rozel, 2.viii.48 (LQ).
Dioctria baumhaueri Mg. Les Platons, 27.vii.55 (LQ).
Philonicus albiceps (Mg.). Blanches Banques, 23.viii.47 (LQ); Le Bourg, 10.viii.48, with prey of the Cordilurid *Ceratinostoma ostiorum* Hal. (LQ).
Asilus crabroniformis L. (LF); Grands Vaux, 28.viii.43 (LQ); Portelect, 2.viii.47 (LQ).
Dysmachus trigonus (Mg.). Specimens taken by Mr. E. Saunders, June, 1903 (LF); July, 1930, with prey of *A.* (*Aspitates*) *ochrearia* Rossi (Lepidoptera) (specimen in Jersey Museum); May, 1932 (ACH); Le Bourg, 7.vii.47, with prey of *Syrphus corollae* F. (LQ).
Eutolmus rufibarbis (Mg.). St. Martin, 12.viii.41 (LQ); St. Ouen's Pond, 14.vii.47 (LQ); St. Martin, 5.viii.48, with prey of the Syrphid *Helophilus pendulus* L. (LQ).

EMPIDIDAE

Bicellaria spuria (Fln.). St. Martin, 30.viii.57 (LQ).
Platypalpus nigritarsis (Fln.). St. Ouen's Bay, 21.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S).
P. longicornis (Mg.). Noirmont, 19.iv.57 (S).
P. pectoralis (Fln.). St. Peter's Valley, 18.viii.47 (LQ).
P. minutus (Mg.). Noirmont, 19.iv.57 (S).
Ocydromia glabricula (Fln.). St. Catherine's Bay, 22.iv.57 (S).
Empis trigramma (Mg.). Taken by Mr. E. Saunders (LF).
E. livida L. Common (LF).
E. femorata F. Noirmont, 19.iv.57 (S).
Chelifera praecatoria Fln. Handois (LQ).

DOLICHOPODIDAE

Dolichopus nubilis Mg. One specimen taken at St. Aubin's, June, 1908 (LF).

LONCHOPTERIDAE

Lonchoptera lutea Panz. La Coupe, 22.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S); Grouville, 24.iv.57 (S); St. Martin, 30.ix.57 (LQ); St. Brelade, 18.iv.54 (LQ); Tesson Mill, 4.x.57 (LQ).
L. furcata (Fln.). Grands Vaux, 21.iv.57 (S).

PHORIDAE

Phora aterrima (F.). Noirmont, 19.iv.57 (S); Tesson Mill 22.iv.57 (S); Rozel, 19.iv.54 (LQ).
Megaselia ciliata (Zett.). Tesson Mill, 23.iv.57 (S).
M. rufipes (Mg.). La Coupe, 22.iv.57 (S).

SYRPHIDAE

Bacha obscuripennis Mg. La Hougue Bie, 15.viii.47 (LQ).
Platycheirus manicatus (Mg.). Taken by Mr. E. Saunders in June, 1903 (LF); St. Catherine's Bay, 27.iv.57 (S).
P. albimanus (F.). E. Saunders, June, 1903 (LF); Handois, 23.iv.57 (S).
P. immarginatus (Zett.). Grève d'Azette, 20.iv.57 (S); Grands Vaux, 21.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S).
P. clypeatus (Mg.). Grands Vaux, 20.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S).
Melanostoma scalare (F.). Handois, 23.iv.57 (S); Grève d'Azette, 20.iv.57 (S).
M. mellinum (L.). St. Brelade, 18.iv.54 (LQ); Tesson Mill, 23.iv.57 (S); Gorey, 18.iv.57 (S); Noirmont, 19.iv.57 (S); Grève d'Azette, 20.iv.57 (S).
Sphaerophoria scripta (L.). St. Ouen's Bay, 22.vii.55 (LQ); var. *dispar* (Lw.). June, 1908 (LF).
S. rueppellii Wied., Tesson Mill, 4.x.57 (LQ).
Xanthogramma pedissequum (Harris). Specimen in Jersey Museum.
Scaeva pyrastri (L.). St. Helier, 3.viii.47; St. Martin, 30.ix.57; Tesson Mill, 4.x.57 (LQ).
Syphus ribesii (L.). St. Peter's, 24.iv.43 (LQ).
S. luniger Mg. Rozel, 19.iv.54 (LQ).
S. corollae (F.). June, 1908 (LF); Le Bourg, 7.vii.47, as prey of Asilid *Dysmachus trigonus* Mg. (LQ); Tesson Mill, 4.x.57 (LQ).
S. balteatus (Deg.). Blanches Banques, 22.vii.47; St. Martin, 30.ix.57; Tesson Mill, 4.x.57 (LQ).
Chrysotoxum festivum (L.). Not common (LF); Mont Mado, 25.vii.47 (LQ).
Rhingia campestris Mg. Tesson Mill, 23.iv.57 (S); St. Peter's, 17.ix.42 (LQ).
Ferdinandea cuprea (Scop.). (LF); Egypt, Trinity, 8.viii.48 (LQ).
Chrysogaster metallina (F.). (LF); Grève d'Azette, 20.iv.57 (S).
C. splendens (Mg.). Taken by E. Saunders (LF); St. Catherine's Bay, 22.iv.57 (S); Grève d'Azette, 20.iv.57 (S).
C. hirtella Lw. Taken by E. Saunders, June, 1903 (LF).

Sphegina clunipes (Fln.). St. Catherine's Bay, 27.iv.57 (S).
Cheilosia illustrata (Harris). Taken by E. Saunders, June, 1903 (LF).
C. impressa Lw. Captured by E. Saunders, June, 1903 (LF).
C. intonsa Lw. Grouville, 24.iv.57 (S).
C. paganus Mg. Tesson Mill, 23.iv.57 (S); 4.x.57 (LQ).
Volucella bombylans (L.). Taken by E. Saunders, June, 1903 (LF); Le Bourg, 21.vi.42 (LQ); Trinity, 18.vii.47 (LQ). Type form and var. *plumata* Degeer.
V. zonaria (Poda). St. Martin, 24.vii.46, 12.viii.47 (LQ).
V. inanis (L.). St. Martin, 5.viii.48 (LQ).
V. pellucens (L.). Vallée des Vaux, 8.viii.53 (LQ).
Eristalis sepulchralis L. Not rare (LF).
E. pertinax (Scop.). Common (LF); Rozel, 19.iv.57 (LQ).
E. tenax (L.). Abundant (LF); Le Bourg, 7.vii.47, 3.viii.48 (LQ); Tesson Mill, 4.x.57 (LQ).
E. arbustorum (L.). Common (LF).
Merodon equestris (F.). Taken by E. Saunders, June, 1903 (LF); Le Bourg, 2.v.53 (LQ).
Helophilus pendulus (L.). Grève d'Azette, 20.iv.57 (S); St. Martin, 5.viii.48 as prey of Asilid *Eutolmus rufibarbis* (Mg.) (LQ).
Xylota segnis (L.). Taken by E. Saunders, June, 1903 (LF).
Syritta pipiens (L.). Common (LF); La Saline, 30.viii.54 (LQ); St. Peter's Valley, 18.viii.47 (LQ); Le Bourg, 7.vii.47 (LQ); St. Catherine's Bay, 22.iv.57 (S); Tesson Mill, 23.iv.57 (S); 4.x.57 (LQ).
Eumerus sabulosum (Fln.). Taken by E. Saunders, June, 1903 (LF).
E. strigatus (Fln.). Tesson Mill, 23.iv.57 (S).

CONOPIDAE

Physocephala rufipes (F.). 6.vii.32 (ACH); St. Peter's Rest, 20.vii.46, 12.vii.47 (LQ); Vallée des Vaux, 29.viii.54 (LQ).
Myopa buccata (L.). One, June, 1908 (LF).

OTITIDAE

Herina frondescentiae (L.). (LF).

PALLOPTERIDAE

Toxoneura muliebris (Harris). St. Peter's Valley, 28.vii.56 (LQ); St. Martin, 11.viii.50 (LQ).

PIOPHILIDAE

Piophila vulgaris Fln. Grands Vaux, 21.iv.57 (S).

TRYPETIDAE

Euribia zoë (Mg.). Les Patons, 13.viii.49 (LQ).
Myiolia caesio (Harris). St. Peter's Valley, 28.vii.56 (LQ).
Trypeta jaceae (R.-D.). Les Patons, 13.viii.49 (LQ).
T. tussilaginis (F.). Griffith Bay, 28.viii.48 (LQ); Rozel, 31.vii.49 (LQ).
Paroxyna parvula (Lw.). St. Ouen's Bay, 31.vii.51 (LQ).
Oxyna flavipennis (Lw.). St. Martin, 5.viii.48 (LQ); Egypt, Trinity, 8.viii.48 (LQ).

Sphenella marginata (Fln.). Egypt, Trinity, 8.viii.48 (LQ); La Saline, 3.viii.51 (LQ).
Tephritis vespertina (Lw.). St. Peter's Valley, 30.xii.48 (LQ); La Coupe, 22.iv.57 (S).
Trupanea stellata (Fuess.). La Coupe, 25.viii.50 (LQ); Grands Vaux, 7.viii.51 (LQ); St. Ouen's Bay, 22.vii.55 (LQ).

LONCHAEIDAE

Lonchaea lauta Collin. Grève d'Azette, 20.iv.57 (S).

SAPROMYZIDAE

Peplomyza litura (Mg.). St. Helier, 29.vii.51 (LQ).

PSILIDAE

Psila nigricornis Mg. Grève d'Azette, 20.iv.57 (S); Tesson Mill, 23.iv.57 (S).

SEPSIDAE

Nemopoda nitidula (Fln.). Tesson Mill, 23.iv.57 (S).
Sepsis sp. Handois, 23.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S).

SCIOMYZIDAE

Ditaenia cinerella (Fln.). St. Ouen's Bay, 17.iv.54 (LQ); Noirmont, 19.iv.57 (S); Grands Vaux, 21.iv.57 (S).
Trypetoptera punctulata (Scop.). St. Peter's Valley, 19.viii.49 (LQ).
Sepedon sphegeus (F.). St. Peter's, 12.vii.47 (LQ); Handois, 25.vii.47 (LQ).
S. spinipes (Scop.). St. Ouen's Bay, 28.viii.54 (LQ).
Lucina fasciata Mg. St. Brelades Bay, 1903 (LF).

CHAMAEMYIIDAE

Chamaemyia flavipalpis (Hal.). St. Catherine's Bay, 22.iv.57 (S); St. Ouen's Bay, 21.iv.57 (S).
C. juncorum (Fln.). Handois, 23.iv.57 (S).

COELOPIDAE

Coelopa frigida (F.). Bagatelle Lane, 22.i.48 (LQ); Grève d'Azette, 12.iv.55 (LQ); Waterworks Valley, 30.ix.57 (LQ); Tesson Mill, 4.x.57, at Ivy (LQ).
Orygma luctuosa Mg. St. Helier, 5.x.57 (LQ).

HELOMYZIDAE

Helomyza variegata Lw. St. Martin, 18.iv.49 (LQ).
Tephrochlamys rufiventris (Mg.). Grands Vaux, 27.iv.57 (S).

OPOMYZIDAE

Opomyza germinationis (L.). Hautes Croix, 6.ix.48 (LQ); St. Martin, 30.ix.57 (LQ); Tesson Mill, 4.x.57 (LQ).
Geomyza tripunctata Fln. Egypt, Trinity, 8.viii.48 (LQ); St. Peter's Valley, 28.vii.56 (LQ); Noirmont, 19.iv.57 (S); Grève d'Azette, 20.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S); St. Martin, 30.ix.57 (LQ).

EPHYDRIDAE

Hecamede albicans (Mg.). St. Ouen's Bay, 9.iv.55 (LQ).

Psilopa nitidula (Fln.). St. Catherine's Bay, 22.iv.57 (S); Grands Vaux, 21.iv.57 (S).
Philygria punctatonervosa (Fln.). St. Ouen's Bay, 25.iv.57 (S).
Hyadina guttata (Fln.). Noirmont, 19.iv.57 (S).
Stictoscatella fallax (Cz.). St. Catherine's Bay, 18.iv.57 (S).
S. quadrata (Fln.). Rozel, 19.iv.54 (LQ); Tesson Mill, at Ivy, 4.x.57 (LQ).
Pœydra coarctata (Fln.). Grouville, 24.iv.57 (S).

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Limosina sylvatica (Mg.). St. Catherine's Bay, 18.iv.57 (S); La Coupe, 22.iv.57 (S); Grands Vaux, 20.iv.57 (LQ).
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L. orbonella Hb. St. Ouen's Bay, 21.iv.57 (S).
Phytomyza albipennis Fln. Noirmont, 19.iv.57 (S); La Coupe, 22.iv.57 (S); St. Catherine's Bay, 22.iv.57 (S).
P. nigra Mg. Tesson Mill, 23.iv.57 (S).
P. flavicornis Fln. La Coupe, 23. iv.57 (S).
P. plantaginis R.-D. Tesson Mill, 23.iv.57 (S).
Phytomyza sp. n. ?. Tesson Mill, 23.iv.57 (S). Mr. K. A. Spencer informs me that this species appears to be new to science, but until more material is obtained it would be unwise to describe it.

CHLOROPIDAE

Elachiptera megaspis (Lw.). La Coupe, 22.iv.57 (S).
Meromyza pratorum Mg. (LF); Blanches Banques, 22.vii.47 (LQ).
Thaumatomyia notata (Mg.). Noirmont, 19.iv.57 (S); Grève d'Azette, 20.iv.57 (S); Grands Vaux, 21.iv.57 (S); Tesson Mill, 23.iv.57 (S).

CORDILURIDAE

Scatophaga stercorarium (L.). Abundant (LF); Grève d'Azette, 20.iv.57 (S); Grouville, 24.iv.57 (S).
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Ceratinostoma ostiorum (Hal.). Le Bourg, 10.viii.48, as prey of Asilid *Philonicus albiceps* (Mg.) (LQ).
Norellisoma spinimanum (Fln.). Handois, 23.iv.57 (S).

TACHINIDAE

Ocyptera auriceps Mg. Tesson Mill, 4.x.57 (LQ). A non-British species.
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Zophomyia temula (L.). Taken by Mr. E. Saunders, June, 1903 (LF).
Micropalpus vulpinus Fln. Giffard Bay, 28.viii.48 (LQ).
Siphona geniculata Deg. (LF).
Gonia ornata Mg. Taken by E. Saunders, June, 1903 (LF).
Carcelia lucorum Mg. Tesson Mill, 23.iv.57 (S).

CALLIPHORIDAE

Parafeburia maculata Fln. Waterworks Valley, 30.ix.57 (LQ).
Onesia aculeata Pand. Noirmont, 19.iv.57; Grève d'Azette, 20.iv.57 (S).
Miltogramma germari Mg. A specimen of this non-British species was taken near St. Ouen's Bay, 31.vii.1903 (LF).
M. punctata Mg. June, 1908 (LF).
Sarcophaga carnaria L. Very common (LF).
S. albicans. One specimen, June, 1908 (LF).
S. setipennis Rd. St. Ouen's Bay, 21.iv.57 (LQ).
Pollenia rudis F. Common (LF).
Lucilia caesar L. Common (LF).
L. sericata Mg. Not uncommon (LF).
Calliphora erythrocephala Mg. Abundant (LF); Grève d'Azette, 20.iv.57 (S).
C. vomitoria L. Abundant (LF).

MUSCIDAE

Musca domestica L. Abundant (LF).
M. autumnalis Deg. (= *corvina* F.). Not rare (LF).
Orthellia caesarion Mg. St. Martin, 30.ix.57 (LQ).
Myospila meditabunda (F.). Grève d'Azette, 20.iv.57 (S).
Mesembrina meridiana (L.). Common, June, 1908 (LF). One specimen in Jersey Museum without data.
Muscina pabulorum Fln. Bagatelle Lane, 22.vii.48 (LQ).
Stomoxys calcitrans (L.). Common (LF).
Fannia canicularis L. Grève d'Azette, 20.iv.57 (LQ).
Azelia cilipes Hal. La Coupe, 23.iv.57; Grands Vaux, 21.iv.57 (S).
Hebecnema umbratica Mg. Grève d'Azette, 20.iv.57 (S).
H. affinis Mall. Tesson Mill, 23.iv.57; Handois, 23.iv.57 (S).
Helina calceata Rd. St. Ouen's Bay, 21.iv.57 (S).
H. duplicata Dsv. (LF).

Fucellia maritima (Hal.). Taken by E. Saunders, June, 1903 (LF); St. Ouen's Bay, 21.iv.57 (S).
Chirosia albitarsis (Zett.). St. Ouen's Bay, 25.iv.57; La Coupe, 22.iv.57 (S).
C. crassiseta (Stein). St. Ouen's Bay, 25.iv.57 (S).
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H. variata Fln. St. Catherine's Bay, 22.iv.57 (S).
H. cilicrura Rond. Larvae attacking tomato plants (Dunn, 1948 : 57). Grève d'Azette, 20.iv.57; Noirmont, 19.iv.57 (S).
H. strigosa F. St. Catherine's Bay, 27.iv.57 (S).
H. trichodactyla Rond. La Coupe, 22.iv.57 (S).
H. fugax Mg. La Coupe, 22.iv.57; Noirmont, 19.iv.57 (S).
H. brassicae Bché. St. Ouen's Bay, 25.iv.57; Handois, 23.iv.57 (S).
H. radicum L. Grève d'Azette, 20.iv.57; La Coupe, 22.iv.57 (S).
H. aestiva Mg. La Coupe, 22.iv.57; Tesson Mill, 23.iv.57 (S).
Anthomyia pluvialis L. Common (LF).
Coenosia geniculata (Fln.). Ouainé, 19.iv.57 (S).
C. tigrina (F.). Tesson Mill, 23.iv.1957 (S).

REFERENCES

DUNN, E., 1948. *Delia cilicrura* Rond. (Dipt., Anthomyiidae) attacking tomato plants in Jersey. *Ent. mon. Mag.,* **84**:57.
EDWARDS, F. W., 1913. Notes on British Mycetophilidae. *Trans. ent. Soc. Lond.,* 334-382.
LUFF, W. A., 1908. The Insects of Jersey. *Rep. and Trans. Guernsey Soc. Nat. Sci. Loc. Res.,* 1908 : 482-511.

BOOK REVIEW

Biologie der primär flügellosen Insekten, by J. Paclt (258 pp., with 138 text figures). (Gustav Fischer Verlag, Jena, 1956. Price 27 DM.)

The appearance of this book is something of an event for those entomologists, ecologists, and others whose interests have at one time or another been excited by apterygote hexapods. It is a very welcome addition to the literature despite certain obvious failings which are noted below. Most entomological textbooks attempt to say something of the hexapods other than insects, but usually so little space is devoted to these groups that the accounts are of little real use, or are even unintelligible. Chapters on the inter-relations of the apterygotes, their anatomy, and development are followed by chapters on the physiology, bionomics and ecology, geographical distribution, and their rôle as pests. Finally, a brief but useful key is given to the families and subfamilies of the classes Collembola, Protura, Diplura, and the order Thysanura.

The ancestry and relationships of the Apterygota are dealt with in the first two chapters. The level of the discussion here may be judged by the fact that all members of the subphylum Antennata that have three pairs of legs are held to be insects. The Collembola are thus once more placed with the Insecta despite the now overwhelming evidence that the hexapodous condition has been evolved more than once within the subphylum. The lack of any close relationship between the Collembola and Insecta noted by many recent writers, especially Handschin, is brushed aside, and the Symphyla are not even mentioned.

From some points of view, especially from an ecological point of view, it is convenient to consider the classes Diplura, Protura, and Collembola together with the primitively wingless Insecta. All of these are correctly included in the category 'wingless Hexapoda' or 'apterygote Hexapoda': the only known apterygote Insecta belong to the order Thysanura.

He repeats the usual error that the tracheal system of the Machilidae does not anastomose: there are in fact connections between segments and between right and left sides as recent work using the cobalt sulphide method of injection clearly shows.

The account given of the post-antennal organ is characteristic of much of the book. Illustrations are given of the external form of the organ, but no sufficient description or figures are given of its histology. It is fit that he should draw attention to the fact that the claim by Marcus that postantennal organs are present in the Dictyoptera and Isoptera is based on mistaking ocelli for the organs in question, but it was quite unnecessary to reproduce the appalling illustrations from the work of Marcus. Many of the illustrations of the anatomy are quite surprisingly poor. For instance, figures 61-63 of the alimentary canal and fat body and figure 65 of the pericardial cells are so poor as to be nearly meaningless.

A bibliography of 89 pages concludes the book and is a most valuable and important part of it and makes its cost easier to bear. The bibliography is preceded by 24 pages given entirely to listing the journals to be cited with the abbreviations used. This seems a shameful waste, as all that was required of the author was to use the abbreviations recommended by the World List and to state that he was so doing.

H. E. HINTON.

A NOTE ON THE COLOUR PRESERVATION OF ODONATA

The technique published by Dr. B. P. Moore for the colour preservation of Odonata (1951, Moore, B. P., *Proc. S. Lond. ent. nat. Hist. Soc.*, 1949-1950: 179-186) has proved most satisfactory where suitable facilities are available to operate a vacuum pump. When collecting abroad, or in the more remote districts of Britain, however, trouble has been experienced in finding suitable means (main

water supply or electric current) to operate the vacuum pump. It was suggested to me by Mr. W. H. Reay that the necessary vacuum might be obtained by connecting the desiccator to the vacuum-operated windscreen-wiper connection of my Ford motor-car. This method has been tested with several *Aeshna* species, and by running the engine slowly for fifteen minutes sufficient exhaustion in the desiccator was obtained to result in excellent colour preservation.

A. E. GARDNER.

HENOTICUS SERRATUS (GYLL.) IN CHALFONT ST. PETER, BUCKS (COL., CRYPTOPHAGIDAE)

On 30th April, 1958, whilst sweeping for Coleoptera on the railway embankment here, I took a specimen of the very scarce *Henoticus serratus*, kindly identified by Mr. R. T. Thompson. Fowler (British Coleoptera, 3) refers to this insect as 'one of our rarest British species', but owing to its inconspicuous size and appearance it is probably often overlooked. The localities given by Fowler are—London district, Forest Hill (one example); Northumberland district, in a wood near Washington (very rare); Scotland, Tay district, Rannoch (very rare).

It has probably been taken elsewhere in more recent years, but I have not seen any record of its capture.

Chalfont St. Peter, Bucks. SIR ERIC ANSORGE.

NOTE ON REARING *SCHRANKIA COSTAESTRIGALIS* STEPHENS (LEP: PLUSIIDAE)

Larvae of the British trio of little moths comprising the genera *Schrankia* and *Tholomiges* appear to be little known and rarely reared, the only instance known to me being Buckler's successful attempt with *S. costaestrigalis*. This species is of interest also because the moth may appear in any month from June until the late autumn, and I even took one in Sussex on 11th November, 1951. The remarkably rapid growth made both by Buckler's larva and the larva that I reared this year suggests that more than one wild brood may be passed in a season.

From a moth taken at Dawlish on 17th August, eggs were laid on the following day and larvae hatched within ten days. But only one survived, feeding on green and succulent lettuce. Its subsequent history was as follows:

First moult	September 4
Second moult	September 8
Third moult	September 12
Fourth moult	September 17
Spun up	September 22
Moth emerged	October 6

It spun a tough cocoon of chewed lettuce and silk.

G. HAGGETT.

A WEEK-END TRIP TO NORTH WALES

By P. J. GENT

In 1956 it was decided to make a week-end trip to see the Large Heath butterfly, *Coenonympha tullia* Müller, on the wing in its North Wales locality near Bala. The date selected was from the Friday evening of 6th July to Sunday, 8th July, with a journey from Northants of about 130 miles each way. A mercury vapour generator was taken, and as my wife and two children insisted on keeping me company along with my bug-hunting friend, Mr. J. H. Payne, tents and camping equipment were no small items.

The Welsh border was reached at Chirk by dusk and tents were set up by mercury vapour light. Quite a number of moths came, and altogether twenty-four species, including *Plusia bractea* Schiff., *Semiothisa liturata* Cl., ab. *nigrofulvata* Collins and other forms, and *Biston betularia* Linn., both type and form *carbonaria* Jordan, were noted. Heavy rain soon put an end to our activities.

The next day we pushed on to Bala in further rain, filled up with provisions, and moved north to our previously selected site at the foot of a mountain by the side of a marsh. In order to give the camping ground time to dry out, we walked the marsh in rubber boots. The rain had stopped by the afternoon, but clouds still hid the sun, and no sign of *C. tullia* could be found, despite most careful searching. But, at last, the sun broke through, and in less than a minute dozens of *tullia* were on the wing, males and females all in good condition, and flying fast in the strong wind. *Parasemia plantaginis* Linn. was also found. Later, as we settled into camp, we felt well pleased, and the journey seemed worthwhile.

I was eager to try the mercury vapour light in this wild place, although conditions seemed cold and damp, and for company we had curlews calling round us all night. Soon the moths came and thirty species were recorded. These included *Amathes ashworthii* Doubl., and *Entephria caesiata* Schiff., which in E. B. Ford's 'Moths' is not shown on the distribution map as occurring in Wales. The most interesting captures, however, were four 'Square spots' which on the sheet seemed large in size and bright in colour. The habitat was right and so was the date, and thinking back to the coloured plate in the *Entomologist's Gazette,* Vol. 2, pt. I, I felt certain I had found *Diarsia florida* Schmidt, the Marsh Square-spot. Mr. L. Goodson of Tring has since given me his opinion to this effect.

We were able to see *tullia* again in the necessary sunshine the next day before we began our return journey from a brief but long to be remembered Welsh weekend.

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